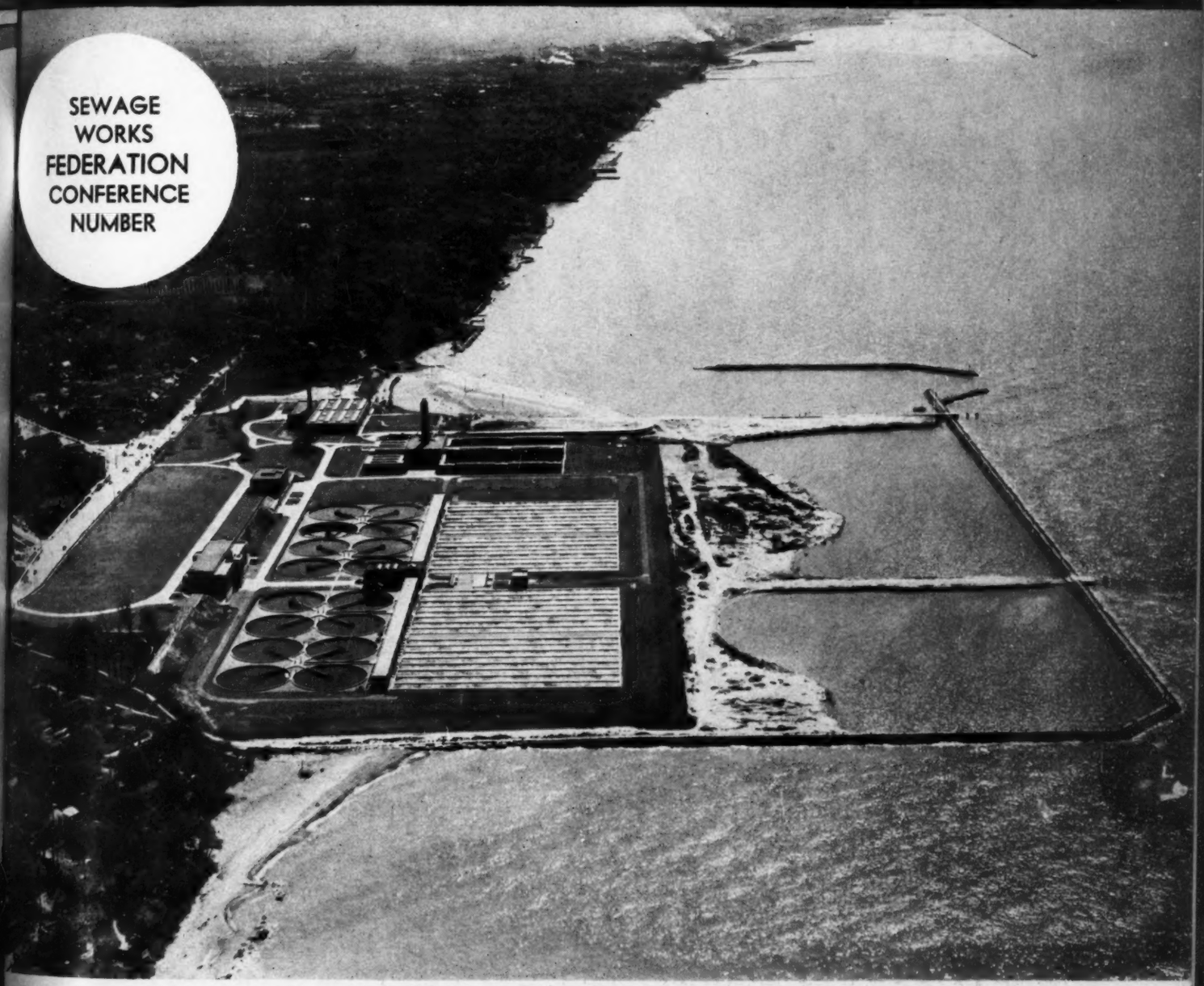
WATER WORKS & SEWERAGE

SEWAGE WORKS FEDERATION CONFERENCE NUMBER



CLEVELAND'S EASTERLY TREATMENT WORKS

(Photo by Aerial Surveys, Inc., Cleveland.)

Get Full Pipeline Flow...and Quick, Surge-Free Closing... with

CHAPMAN CONE VALVES

To any water, sewage, air or gas service, this plug-type valve brings many exclusive operating advantages. Its waterway is the full diameter of the pipeline, so there is no obstruction to flow. The plug is fully seated, whether open or closed, and all seats are fully protected. In operation this valve is self-cleaning, so there is no chance of fouling. In the automatic valve, the operating mechanism automatically unwedges, rotates, and rewedges the plug . . . quickly completing a positive, easy closing without surge or wear on seats. And what's more, this unique valve is equally dependable either for frequent or emergency use.

Chapman builds the Cone Valve for manual, hydraulic or electric operation, as required . . . and with the particular type of control best suited to the individual installation.

The **CHAPMAN VALVE** *Mfg. Co.*

INDIAN ORCHARD, MASSACHUSETTS

WATER WORKS & SEWERAGE, October, 1942. Volume 89. Number 10. Published monthly by Gillette Publishing Co., 330 South Wells Street, Chicago, Ill. Per copy, 25c. Subscription rate, United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as Second Class Matter, June 2, 1931, at the Post Office at Chicago, Ill., under Act of March 3, 1879.

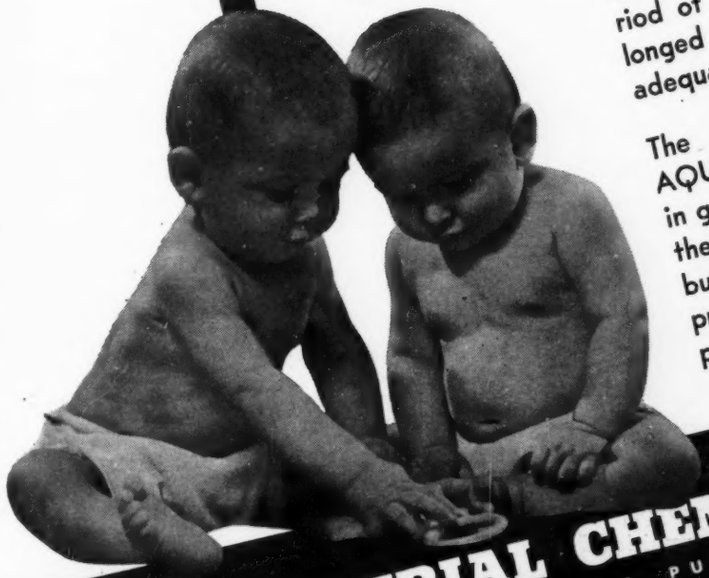
A GREAT PAIR !

DISPERSION AND SUSPENDABILITY IN ACTIVATED CARBON

These two methods of evaluation are rapidly growing in popularity because they are a means of measuring those physical characteristics of activated carbon which enable each individual particle to accomplish more economically the removal of taste and odor producing substances.

Carbon particles which disperse readily throughout the water will greatly increase the immediate adsorption of impurities. However, if the carbon particles settle out in a relatively short time they cannot remove the remaining tastes and odors. Here is where superior suspendability proves advantageous because the carbon particles remaining suspended in the water for a longer period of time have a more prolonged opportunity to provide adequate control.

The extraordinary porosity of AQUA NUCHAR not only results in greater adsorption because of the larger surface area exposed but also accounts for its superior properties of dispersion and suspendability.



INDUSTRIAL CHEMICAL SALES

DIVISION WEST VIRGINIA PULP & PAPER COMPANY

230 PARK AVENUE, NEW YORK CITY
35 E. WACKER DRIVE, CHICAGO, ILLINOIS
748 PUBLIC LEDGER BLDG., PHILADELPHIA, PA.
844 LEADER BLDG., CLEVELAND, OHIO.

INSURES PALATABLE DRINKING WATER
NUCHAR
AQUA

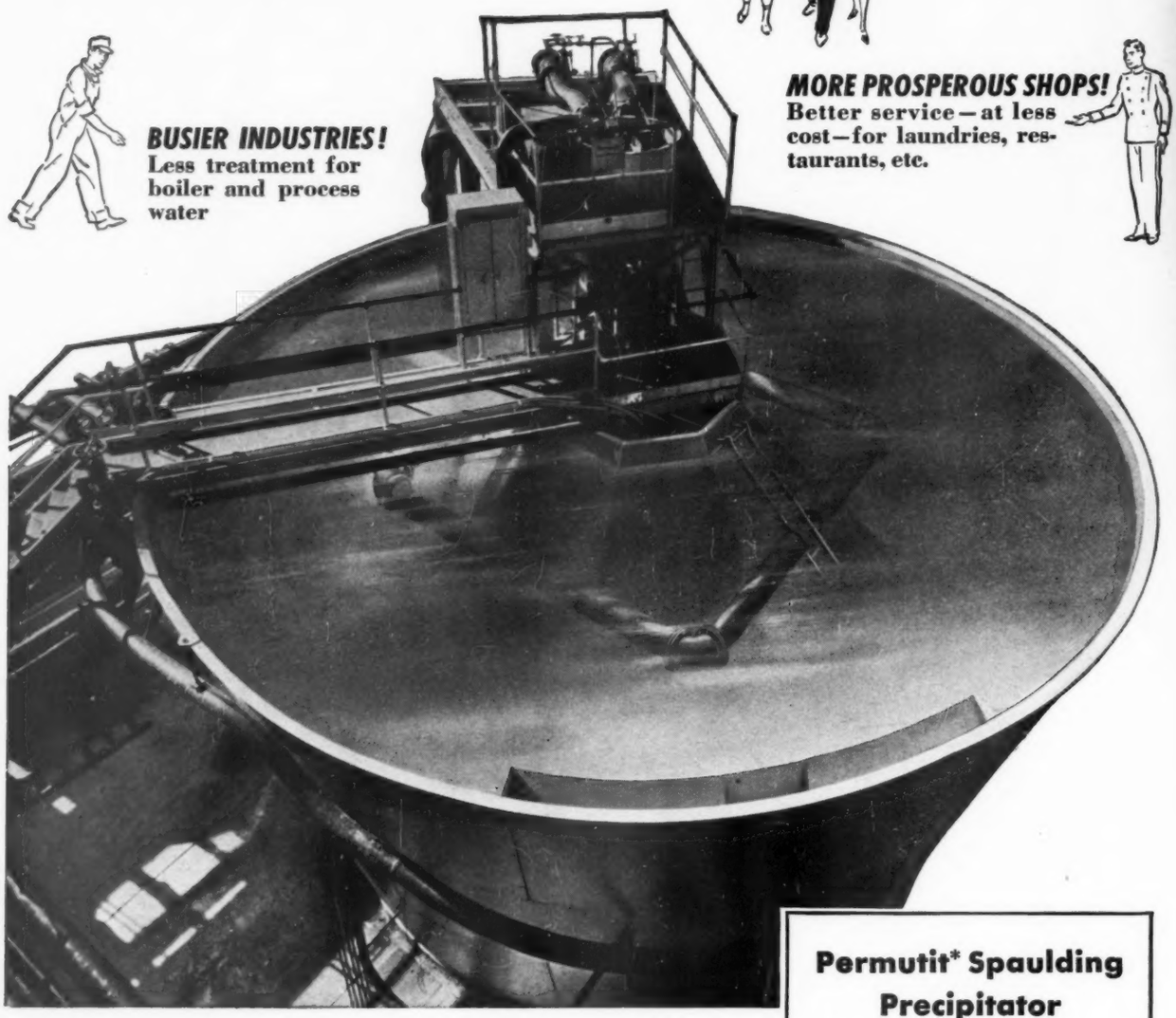
A BRIGHTER FUTURE FOR YOUR CITY

—in soft, clear, iron-free water

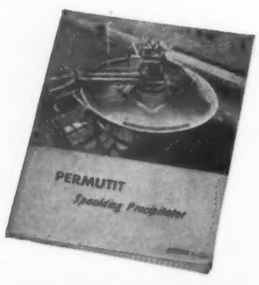
HAPPIER HOMES!
Soft, clear water means less work, more fun

BUSIER INDUSTRIES!
Less treatment for boiler and process water

MORE PROSPEROUS SHOPS!
Better service—at less cost—for laundries, restaurants, etc.



Plan now for better water



After the war, when public improvements are resumed, a good water supply will be the first thought of many communities. Take the first step toward this modern necessity *now.* Write for free booklet to The Permutit Company, Dept. G1, 330 West 42nd Street, New York, N. Y. In Canada: Permutit Company of Canada, Ltd. . . Montreal . . Toronto . . Winnipeg . . Calgary.

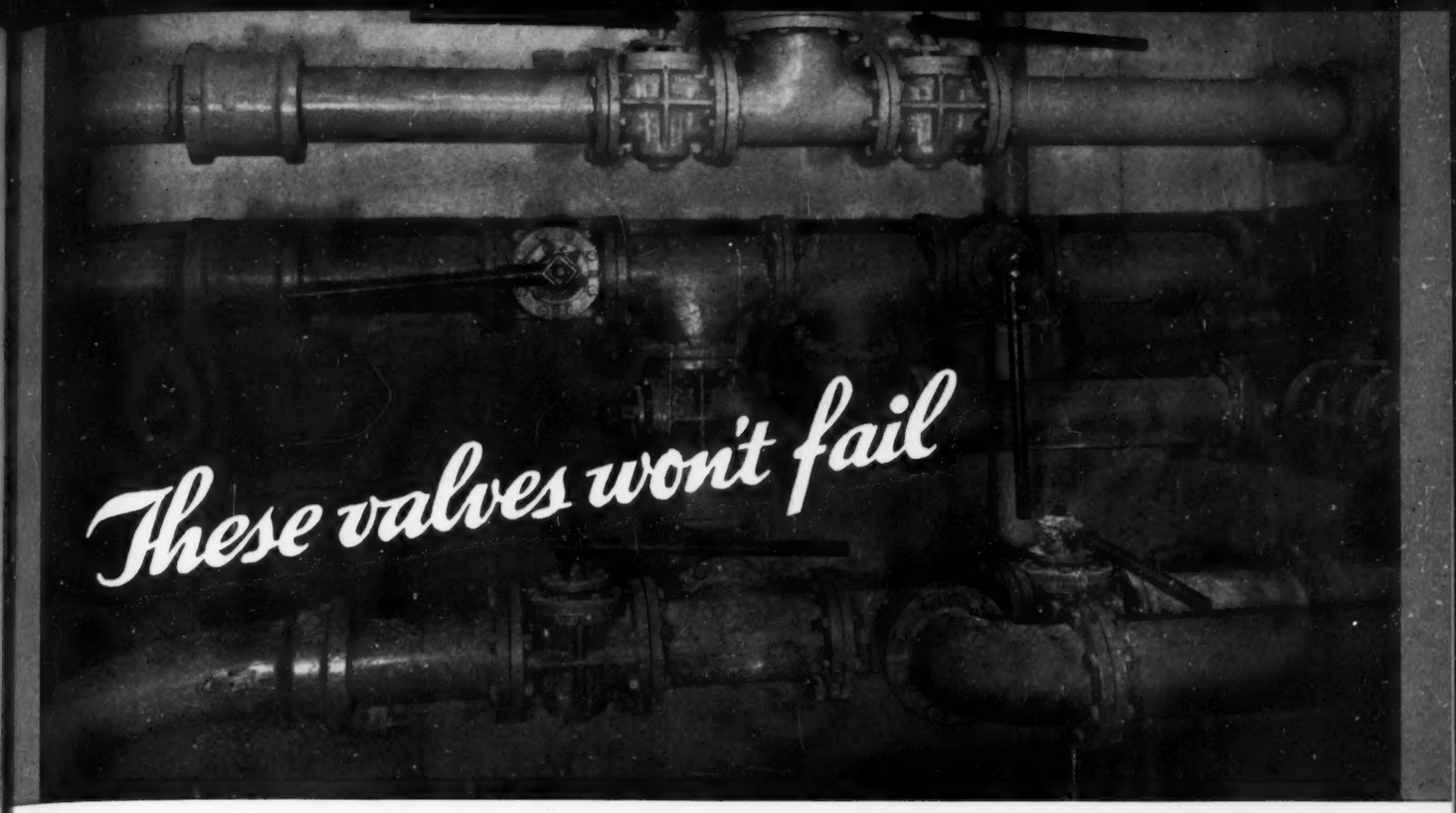
*Trademark Reg. U. S. Pat. Off.

Permutit* Spaulding Precipitator

Here's a new type of equipment that puts soft water within reach of every community. It makes cold lime soda treatment more practical than ever before, because it takes only half the space of old-type plants, cuts precipitation time, makes big savings in chemicals.

PERMUTIT

WATER CONDITIONING HEADQUARTERS



—they're NORDSTROMS

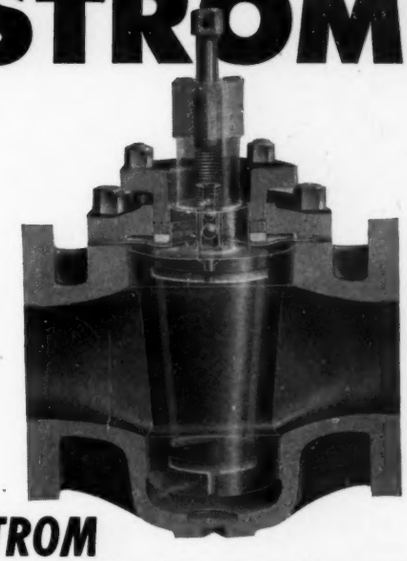
The Ideal Valve for Sewage Disposal Plants

SINCE the introduction of the Nordstrom Valve to the sanitation field, many thousands have been installed. Engineers who have specified them and operators with daily experience for guidance have been most enthusiastic over their performance. The heterogeneous nature of the fluids in sewage disposal plants has made the pressure lubricated Nordstrom Plug Valve desirable for all valve services therein. Basically, the superiority of Nordstrom Valves over conventional types lies in their resistance to leakage and the fact that they always open or close easily. In addition, the Nordstrom Valve design is such that the presence of abrasive grit and other solid matter is of no consequence and corrosion and erosion, common to most sewage plant valve services, are greatly nullified with the result that Nordstroms will outlive the average valve several times over.

Treatment Plant Applications

While the Nordstrom Valve has universal application, it has proven particularly satisfactory for the following treatment plant services:

Lateral Air Lines • Sludge Lines • Grit Chamber Drain Lines • Pump Suction and Discharge Lines handling sludge or gritty materials • Sewage Gas Lines • Water Lines



NORDSTROM
The Perfect Lubricated Valve

THE Nordstrom Valve is of the plug cock type with lubricating and plug lifting features that make it easy and sure of operation. In Nordstrom Lubricated Plug Valves you will find the perfect application of a principle. Utilizing hydraulic pressure through the medium of lubricant, the plug is always seated, yet easy to turn. Lubricant, in stick form, is inserted in the shank. It is transmitted under pressure by turning the lubricant screw, an operation which is occasionally repeated whenever the plug is hard to turn or increased pressure is required to seal the valve. All Nordstroms are quarter-turn and means are provided for indicating to the operator whether the valves are in open or closed position. Check valves in the shank are additional precaution against leakage while the lubricant screw is removed.

In terms of *service,* Nordstrom Valves are lowest in cost, proved by tens of thousands of installations in every field where valves are subjected to difficult operating conditions. Apply Nordstroms to *your* valve problems.

MERCO NORDSTROM VALVE COMPANY
PITTSBURGH EQUITABLE METER CO.

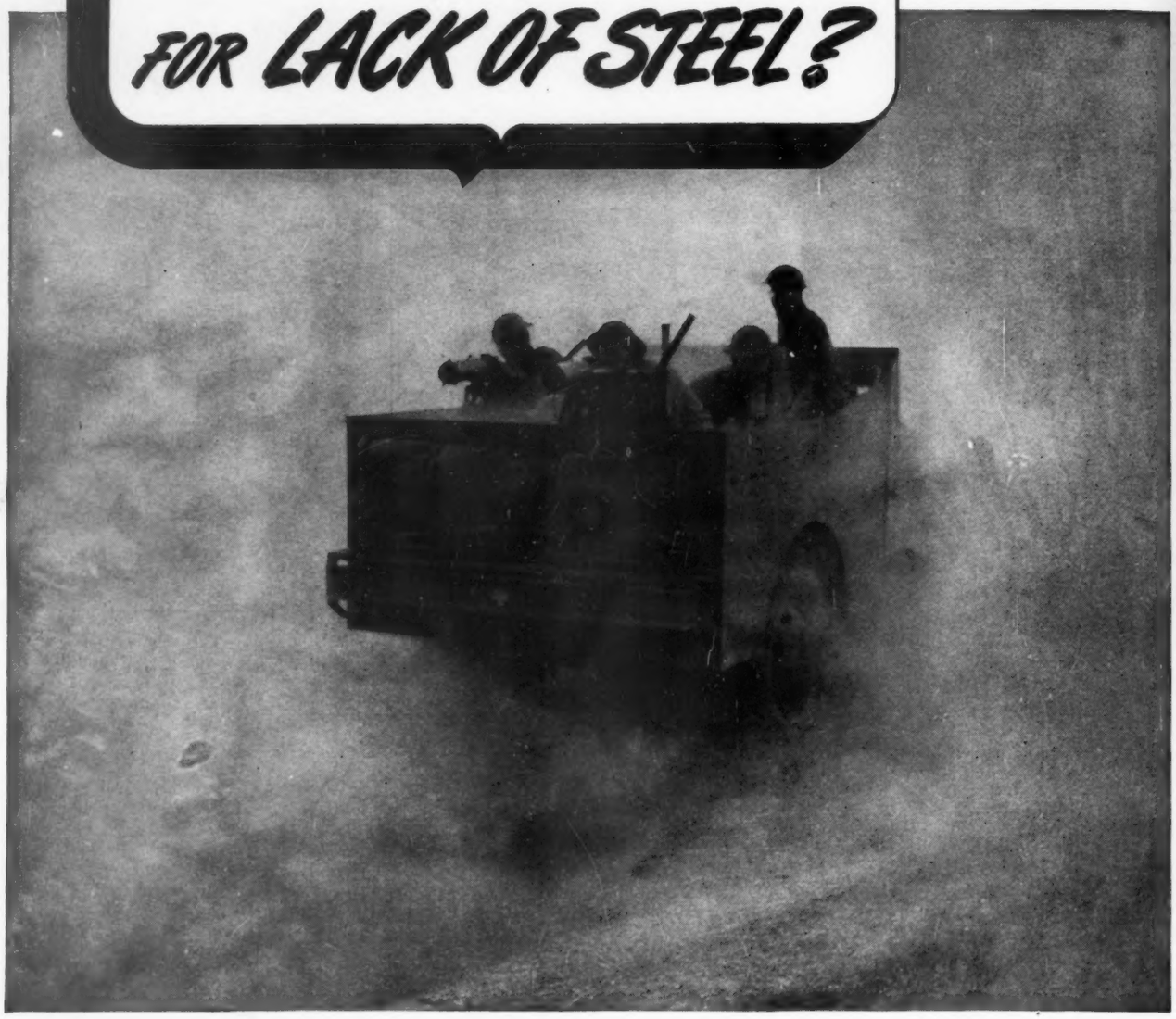
NEW YORK BROOKLYN DES MOINES MEMPHIS OAKLAND TULSA CHICAGO BOSTON

Main Offices, Pittsburgh, Pa.
NATIONAL METER DIVISION, Brooklyn, N. Y.

KANSAS CITY PHILADELPHIA SAN FRANCISCO LOS ANGELES SEATTLE HOUSTON COLUMBIA BUFFALO

TO ACCURATELY MEASURE GAS AND WATER USE EMCO SEWAGE GAS METERS AND PITTSBURGH WATER METERS

WILL OUR MEN LOSE BATTLES *FOR LACK OF STEEL?*



WAR *IS* HELL! Yet this war could be worse than hell. Crucial battles will be lost and needless thousands of lives sacrificed unless our fighting men get all the equipment they need.

LET'S LOOK AT THE FIGURES: Most of this equipment is largely made of steel. Our steel industry made sixty-seven million tons in 1940. It produced eighty-three million tons in 1941. *Yet we need still more.* This year the steel industry *can* produce ninety million tons if you and other Americans will *gather up* and *turn in* six million *additional* tons of scrap.

WHY SCRAP IS NEEDED: New steel is made from scrap iron and pig iron—about half and half. Because the scrap has already been refined it cuts down priceless production time.

WHAT CAN *YOU* DO? Plenty! Gather up all worn-out or obsolete tools, equipment and other useless materials. Urge your associates to do the same. Then call the scrap dealer. He'll hurry it off to the steel mills. All scrap will be purchased by the steel industry at government-controlled prices.

BACK UP OUR FIGHTING MEN: The least you can do for our fighting men, perhaps one close to you, is give them the equipment they *must* have. Every minute is precious. Get in the scrap—fast. Armco Drainage Products Assn., Middletown, Ohio.

★ ★ ★ ARMCO ★ ★ ★

This advertisement is in support of the Salvage Program of the Conservation Division of the War Production Board.

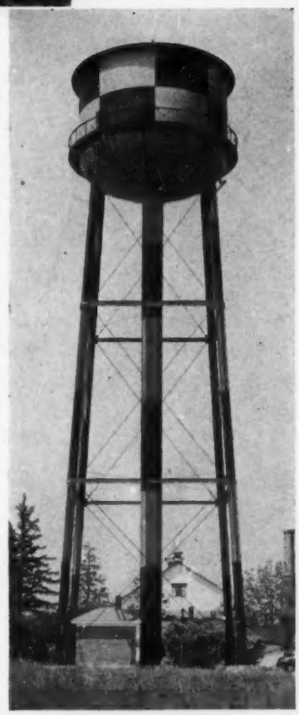
DEPENDABLE *Elevated Storage-*

—an important part of
Efficient Water Supply Systems

THESE three Horton elevated tanks, forming an integral part of the water supply system at an Ohio Ordnance Plant—are *symbols of dependability.* This type of modern elevated storage assures adequate service in case of accidental power failure, and helps to meet heavy drafts at peak periods—in addition to providing adequate reserve for fire protection.

Municipalities with Horton elevated tanks are able to meet today's increased domestic and industrial water demands efficiently and economically. By providing for pumping during off-peak periods these tanks assure improved service at lower costs.

The elevated tank in the upper left-hand view is one of three installed at an Ohio Ordnance plant. It is a 200,000-gal. structure, 100 ft. to bottom and provides gravity water pressure for fire protection in the Fuze and Booster Area. The tank shown directly above is also 200,000-gals. capacity, 122 ft. 9 in. to bottom. It supplies water to automatic sprinklers in certain load line units. At the right is the third ellipsoidal-bottom tank at this plant, a 100-000-gal. capacity unit and 92 ft. 10 in. to bottom.



CHICAGO BRIDGE & IRON COMPANY

Chicago.....2193 McCormick Bldg.	Birmingham..1586 North 50th Street	Philadelphia...1644-1700 Walnut St.
New York.3390-165 Broadway Bldg.	Tulsa.....1646 Hunt Bldg	Washington.....330 Bowen Bldg.
Cleveland.....2262 Guildhall Bldg.	Houston.....5615 Clinton Drive	San Francisco.....1083 Rialto Bldg.
Havana.....402 Edificio Abreu	Detroit.....1551 Lafayette Bldg.	Greenville.....York Street

Plants at BIRMINGHAM, CHICAGO, and GREENVILLE, PA. *In Canada:* HORTON STEEL WORKS, LIMITED, FORT ERIE, ONT.

A Nation-Wide

Thousands of communities throughout the nation have installed Johns-Manville Transite Pipe for water lines. Today the entire production is being used for the war program, where, under similar service conditions it is providing the same efficient, low-cost water transportation it has contributed to our civilian needs.

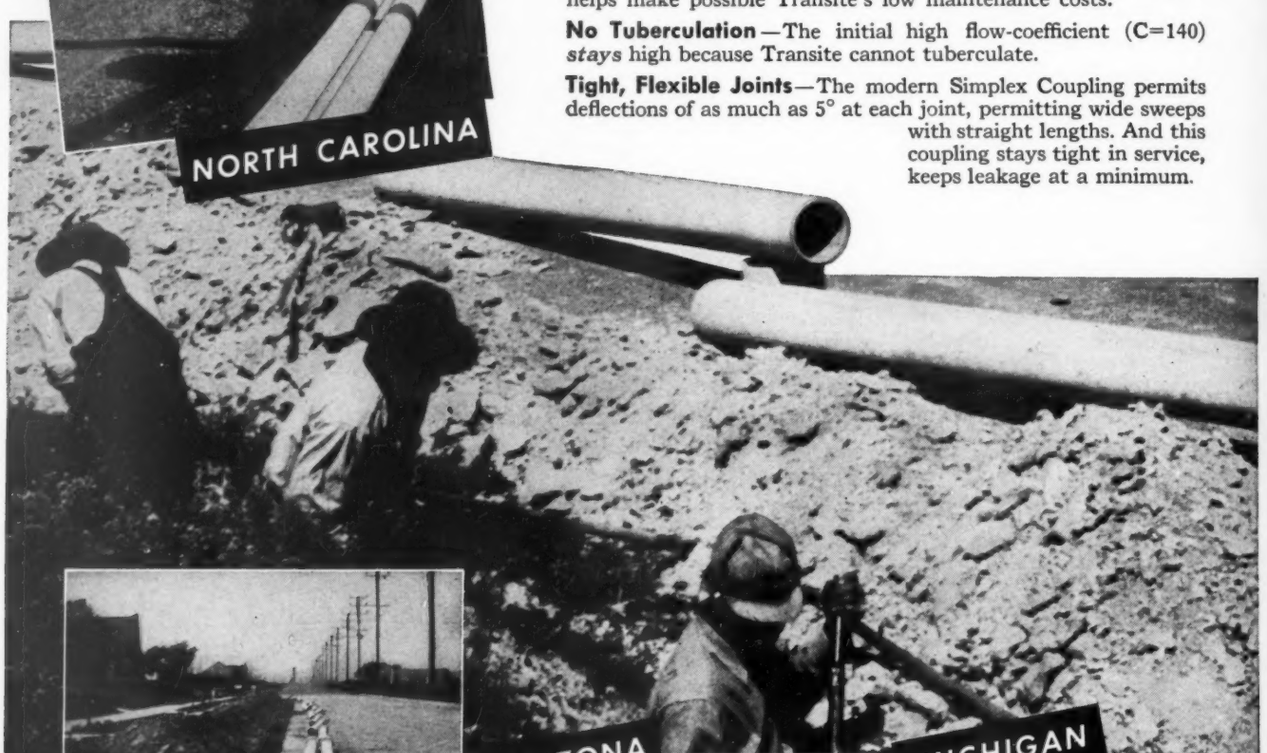
Easy to handle—Light in weight, Transite Pipe comes in 13-foot lengths. All but the larger sizes can be handled without mechanical equipment.

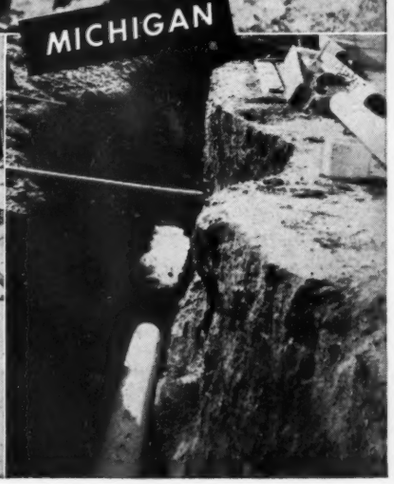
Rapid Assembly—Even unskilled crews can form tight joints quickly and easily with the Simplex Coupling. No heating or pouring required.

Low Maintenance—High corrosion-resistance, a feature of Transite's asbestos-cement composition, plus lasting tight joints, helps make possible Transite's low maintenance costs.

No Tuberculation—The initial high flow-coefficient (C=140) *stays* high because Transite cannot tuberculate.

Tight, Flexible Joints—The modern Simplex Coupling permits deflections of as much as 5° at each joint, permitting wide sweeps with straight lengths. And this coupling stays tight in service, keeps leakage at a minimum.

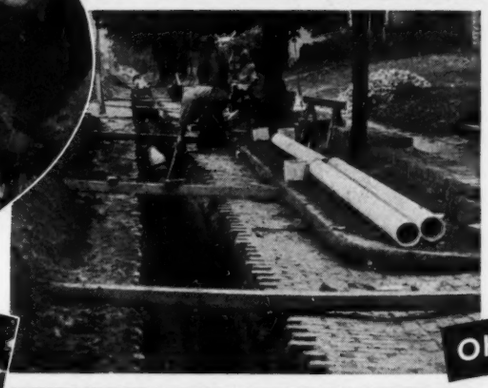




Trend...

NEW YORK

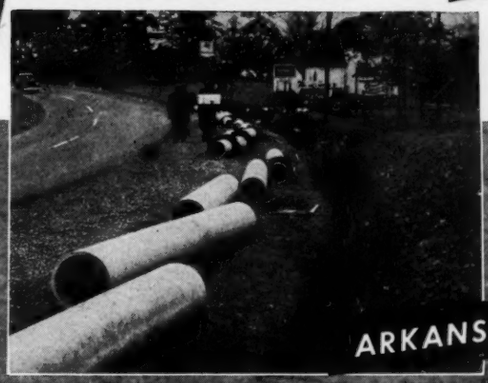
NEW JERSEY



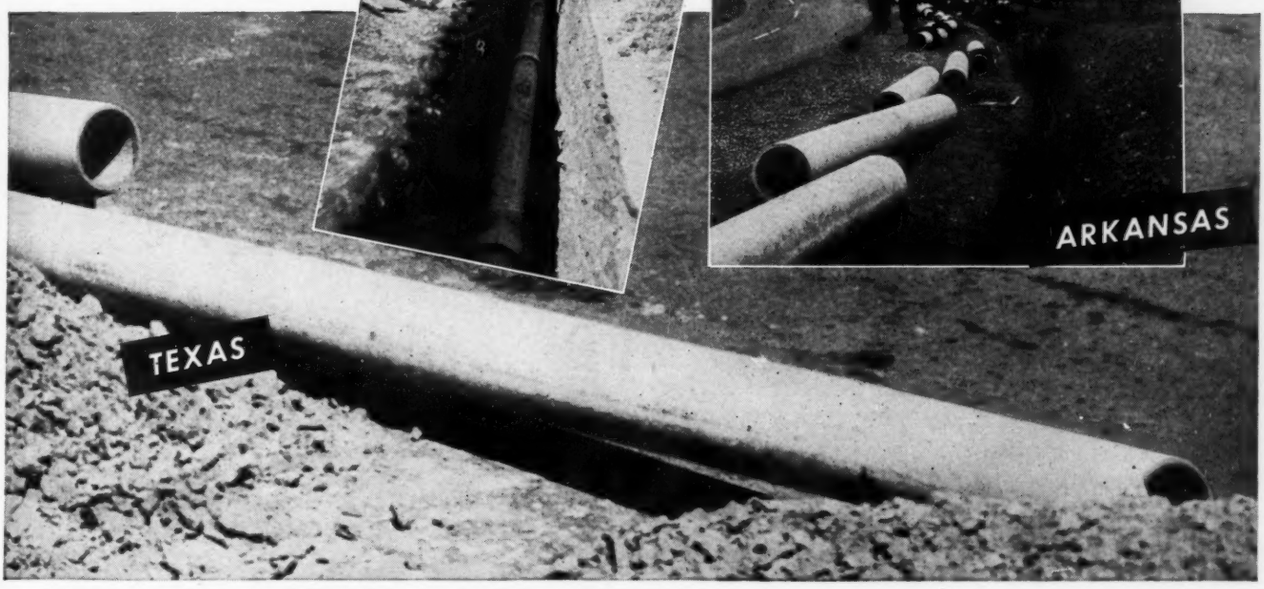
OHIO

FOR DETAILS on Transite Pressure Pipe, write for brochure TR-11A. Information on Transite Sewer Pipe for lower cost sewage-disposal systems is available on request—brochure TR-21A. Johns-Manville, 22 East 40th Street, New York, N. Y.

MASSACHUSETTS



ARKANSAS



TEXAS

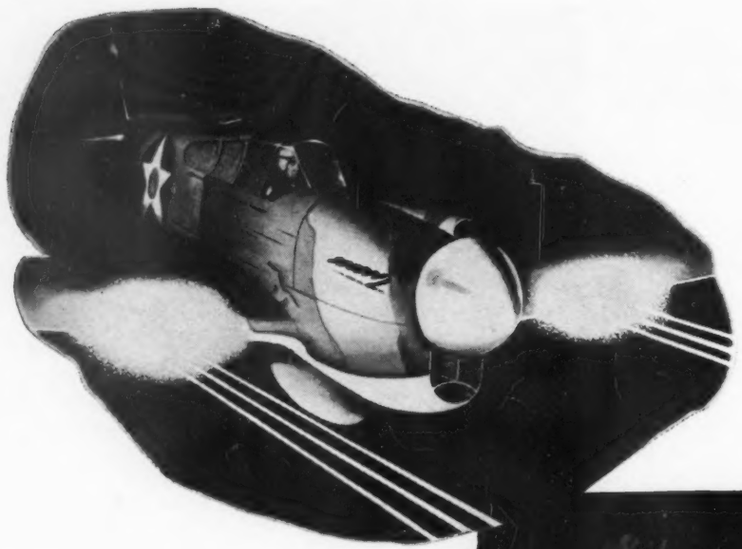
JOHNS-MANVILLE

JOHNS MANVILLE JM PRODUCTS

Transite Pipe

AN ASBESTOS PRODUCT

FOR EFFICIENT, ECONOMICAL WATER AND SEWER LINES



To mix tracer bullet powder . . .

Cast Everdur Copper-Silicon Alloy cone blender for mixing war-vital tracer bullet powder. Made by The H. K. Porter Company, Inc.

THESE *Everdur* CONE BLENDERS

Everdur* gets the call for these and other tough war tasks for the same basic reasons that made this copper-silicon alloy so useful in sewage treatment plants. It is strong, rust-proof and highly resistant to corrosion . . . it has a high endurance limit, fights fatigue . . . it is readily welded and ideally suited to engineering construction involving both wrought and cast parts. These are some of the reasons why Everdur Metal is in such great demand today. 42110-S

ANACONDA

*Registered in U. S. Patent Office

Everdur {COPPER-SILICON} *Alloy*

THE AMERICAN BRASS COMPANY • General Offices: Waterbury, Connecticut

Subsidiary of Anaconda Copper Mining Company • *In Canada:* ANACONDA AMERICAN BRASS LTD., *New Toronto, Ontario*

(Left) Mobile water purification unit, used by Engineer Water Supply Battalion, has a treating capacity of 5,000 gallons of water per hour. (Photo by U. S. Army Signal Corps)

●

(Below) Mounted on a 2½ ton, 6 x 6 truck, this mobile water purification plant can follow U. S. troops in the field. (Photo by U. S. Army Signal Corps)

HTH is in the army now—

Dry Chlorine Carriers Safeguard Health of U. S. Troops

Imagine pulling up to a mud-hole and — presto! — converting it into a source of sanitary drinking water! That's the job the Army's mobile water purification units are called upon to do. On maneuvers and in battle, they are never far behind the front lines. Mounted on fast-moving trucks, they draw up beside lakes and watercourses to provide safe drinking water for troops on the move.

The active sanitation principle employed by these motorized water purification plants is HTH or other dry chlorine carriers. HTH is also used extensively at training centers and other military establishments to purify drinking water for officers and enlisted personnel. Then, too, before water systems can be put into operation, water mains must be flushed with chlorine solutions to kill deadly bacteria. And, of course, sanitary measures governing the disposal of sewage require additional quantities of fast-killing chlorine carriers.

Today, America needs chlorine in mobile, dependable form to safeguard the health of its armed forces, at home and abroad. That's why the War Production Board has recently taken over complete control of the distribution of calcium hypochlorite, giving the Army, Navy and Marine Corps first call on available supplies.

THE **Mathieson Alkali Works** (INC)

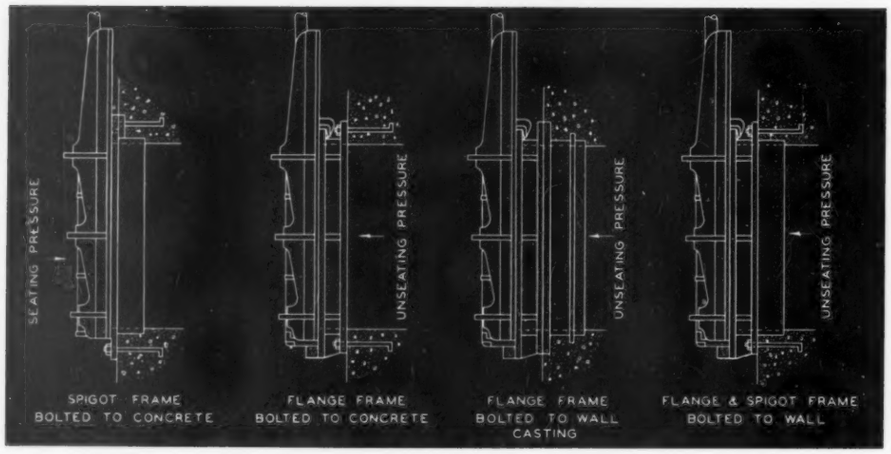
60 E. 42ND ST., NEW YORK, N. Y.

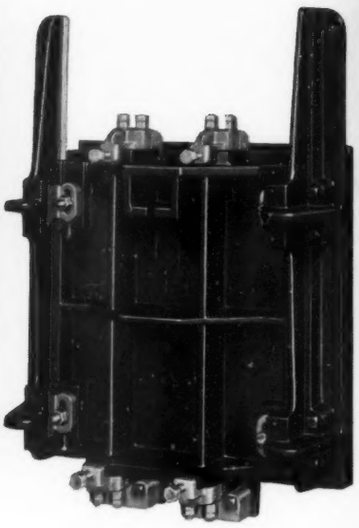
LIQUID CHLORINE . . . HTH . . . SODA ASH . . . CAUSTIC SODA . . . BLEACHING POWDER . . . AMMONIA, ANHYDROUS and AQUA . . . BICARBONATE OF SODA . . . PH-PLUS (FUSED ALKALI) . . . DRY ICE . . . CARBONIC GAS . . . SYNTHETIC SALT CAKE . . . SODIUM CHLORITE PRODUCTS

NATIONAL

WATER WORKS AND SEWERAGE

SLUICE GATES • EQUIPMENT • GATE VALVES





National Sluice Gates are available in designs for all usual methods of securing the gate to its foundation

A 48" National Gate Valve

These time-tested products offer the sturdiest kind of heavy-weight construction without sacrifice of smoothly precise operation. Length of service is guaranteed by the excellence of material and painstaking workmanship which goes into every National unit.

For example, National Sluice Gates are distinguished by the careful machining and fitting of all sliding and screw parts. The facings on the frames and discs are made of a special-analysis bronze, found most suitable for the required service, and thoroughly peened into machined, dove-tailed grooves. All wedges and hooks are of Manganese Bronze. These Gates are *water-tight* and open and close easily without chattering.

National Gate Valves are built strictly in accordance with the full specifications of the American Water Works Association. In either standard or specialized designs, these valves have a proven record of long, trouble-free life.

Estimates and engineering counsel are available to you at all times. Write for further information.

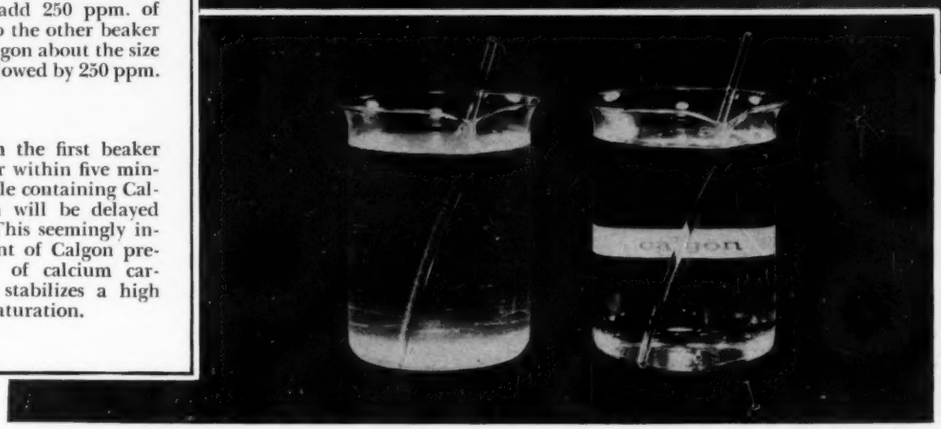
NATIONAL MACHINE WORKS

1559 North Sheffield Avenue Chicago, Illinois

A "MILLION TO ONE" SHOT *that always comes through!*

PREPARE two beakers of hard water. To one beaker add 250 ppm. of soda ash only. To the other beaker add a flake of Calgon about the size of a pin-head, followed by 250 ppm. of soda ash.

PRECIPITATION in the first beaker will usually occur within five minutes. In the sample containing Calgon the reaction will be delayed for many days. This seemingly insignificant amount of Calgon prevents deposition of calcium carbonate—actually stabilizes a high degree of supersaturation.



THIS simple experiment shows you how an extremely small amount of Calgon stabilizes water after lime, or lime-soda softening.

You know that lime, or lime-soda softened water, usually contains excess calcium carbonate in solution . . . that unless this supersaturation can be effectively controlled, you get cementation of filter sands and scale deposits in water lines and water heater coils.

But, did you know that effective stabilization, with protection from corrosion, can be best obtained with Calgon? Added after the softening process, Calgon stabilizes water to the farthest extremities of the system and eliminates precipitation of calcium carbonate in mains and water heaters.

This means that you can maintain the maximum capacity of your mains, with flow unrestricted by scale formations. Equally important, you can render a real service to your customers by preventing expensive repairs to water heaters and avoiding replacements of increasingly critical metals.

You can accomplish all these benefits at a cost so low it will surprise you. The amount of Calgon needed runs from 1 to 5 ppm., depending on individual plant conditions. Send the coupon for complete information and a sample of Calgon.*

Calgon solves 4 water works problems

1. **Prevention of scale** from hard, high-bi-carbonate waters. Calgon, added at the plant, prevents scale formation in mains, meters and hot-water heaters, throughout the system.

2. **Corrosion control**—Calgon forms a thin protective film on metals and metal oxides at pH values of 5.0 and higher. This reduces the attack of oxygen to such an extent that corrosion ceases to be a problem.

3. **Prevention of "red water"** — Calgon prevents the precipitation of dissolved iron. Thus "red water," either from iron initially present in well water, or from corrosion, can be eliminated.

4. **Stabilization of water** following lime or lime-soda softening. Calgon's ability to prevent precipitation of calcium carbonate stabilizes water to the ends of the system.

Calgon is the registered trade-mark of Calgon, Inc. for its glassy sodium phosphate products.

Calgon, Inc.
Hagan Building, Pittsburgh, Pa.

Gentlemen:
Please send complete information about Calgon for ☐ Preventing "Red Water" ☐ Control of Corrosion ☐ Scale Prevention ☐ Stabilization of water.

Name_____

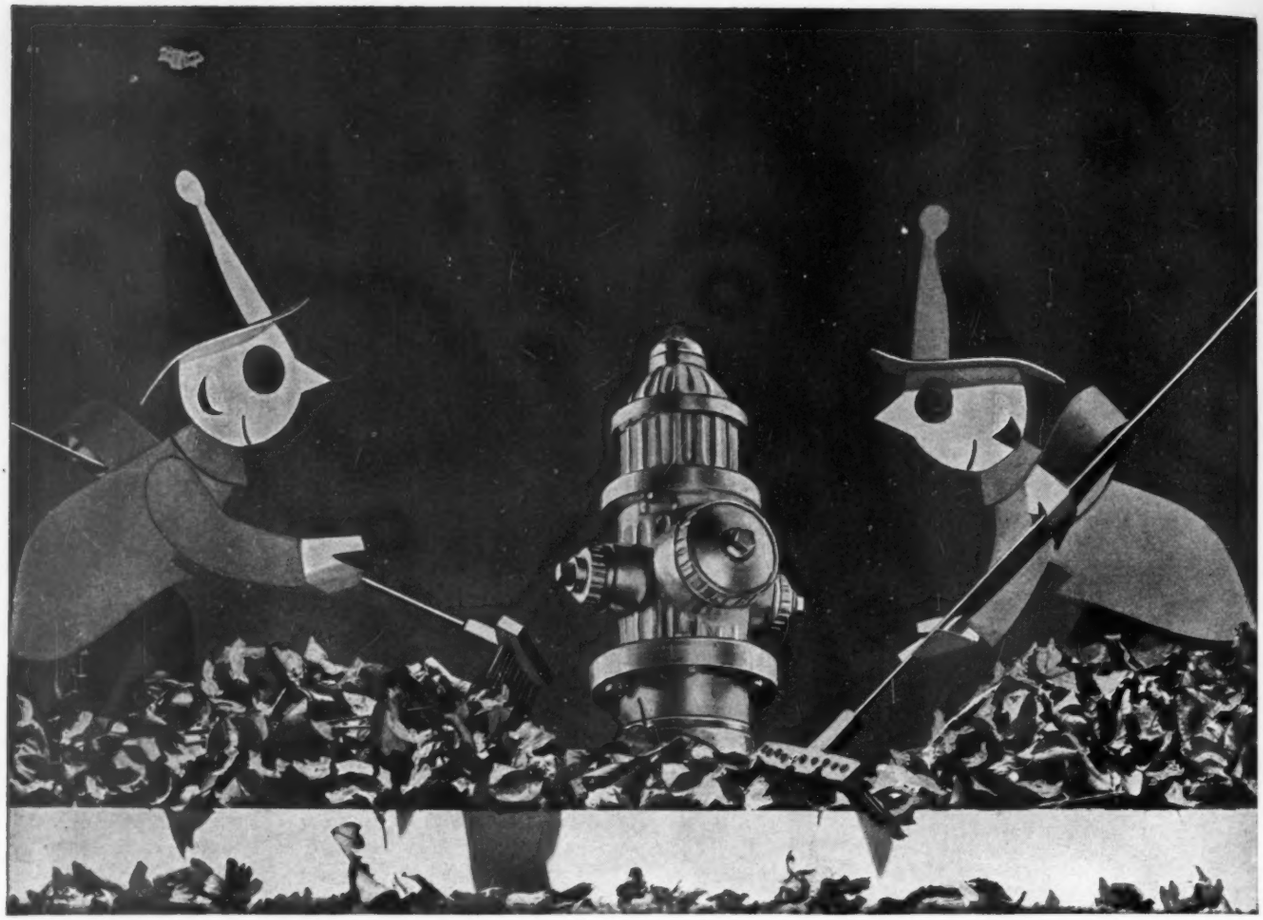
Company_____

Address_____

City_____ State_____

calgon, inc.

HAGAN BUILDING PITTSBURGH, PA.



"SPEAKING OF WINTER—
THERE'S THE WORLD'S FROST-PROOFEST HYDRANT"

For one thing, every Mathews Hydrant has its own "overcoat", a dead-air space between its unique protection case and the barrel which contains all working parts. For another, the Mathews barrel is never put under any strain by frost-heaved ground. The loose protection case is free to lift or settle as the ground moves. For a couple more, Mathews Hydrants have positive, direct-acting drain valves and dry, sealed operating threads.

Any Mathews-protected community has the world's "frost-proofest" hydrant.

MATHEWS HYDRANTS

400 CHESTNUT STREET, PHILADELPHIA, PA.

ESTABLISHED IN 1803

Made by R.D. WOOD Company

MANUFACTURERS OF SAND SPUN PIPE (CENTRIFUGALLY CAST IN SAND MOLDS) AND R. D. WOOD GATE VALVES

May the wreath we have won never wither

THE War Department and the Navy Department of the United States have conferred upon the men and women of Chain Belt Company the highest honor that can be paid to civilians engaged in war work . . . the Army-Navy "E" for outstanding achievement in production.

Because of our knowledge of the intense determination for Victory which has inspired Chain Belt workers in their willingness to serve and sacrifice, we were not surprised that the award was made. We knew it had been earned and we are gratified that this just recognition has been given.

The Army-Navy "E" pennant will fly proudly from the Chain Belt flagstaffs; and from the lapel of every worker will gleam the shining badge of honor which the Government has cast to signify individual and collective effort beyond the normal conception of duty.

Chain Belt will endeavor to maintain the pace which it has established—to produce more and more for the triumph of our arms.

May the wreath we have won never wither!

THE LAUREL *of this wreath is a symbol of the Victory which Chain Belt workers are determined to win.*

THE OAK *of the wreath symbolizes the strength of the nation—on the battle lines and on the production front.*

CHAIN BELT CO.
OF MILWAUKEE
REX SANITATION EQUIPMENT

GRIT REMOVAL at LARGE and Small Plants

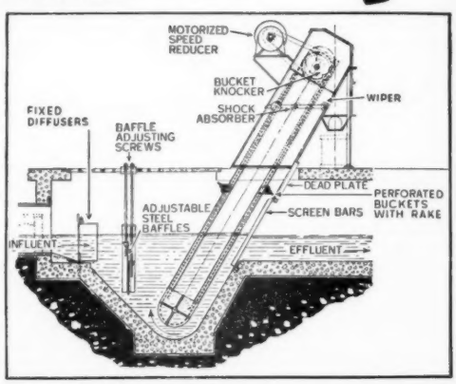
Remove grit at the earliest possible stage in the treatment of sewage, or it will cause trouble all along the line—in excessive wear on pumps, clogging of valves and siphons, etc. Because it is designed and constructed to keep operating costs at a minimum, with efficiency and flexibility to meet varying conditions, Link-Belt equipment is preferred by many progressive communities everywhere.

LINK-BELT COMPANY

Philadelphia Chicago Cleveland Indianapolis Los Angeles Toronto

Tritor Screen

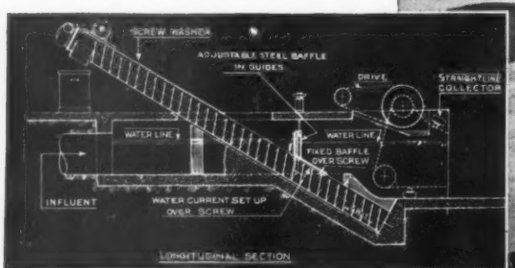
The Link-Belt TRITOR Screen illustrated by the drawing at the right, is a unit which combines the functions of a mechanically cleaned bar screen and grit chamber. For small and medium size plants.



STRAIGHTLINE Grit Collector and Washer

The rectangular-shaped grit chamber, as used with the Link-Belt grit collector and washer, is usually more efficient in settling action than chambers of other shapes. The washing and dewatering screw of the Link-Belt unit is provided with means for close regulation of the wash water, assuring a low percentage of putrescible material and moisture in the detritus. The grit is removed from the chamber and delivered to the screw washer by means of the STRAIGHTLINE collector. (See drawing below.)

The drawing below shows a section of a Link-Belt STRAIGHTLINE Collector and Washer showing principally the washing and dewatering screw.

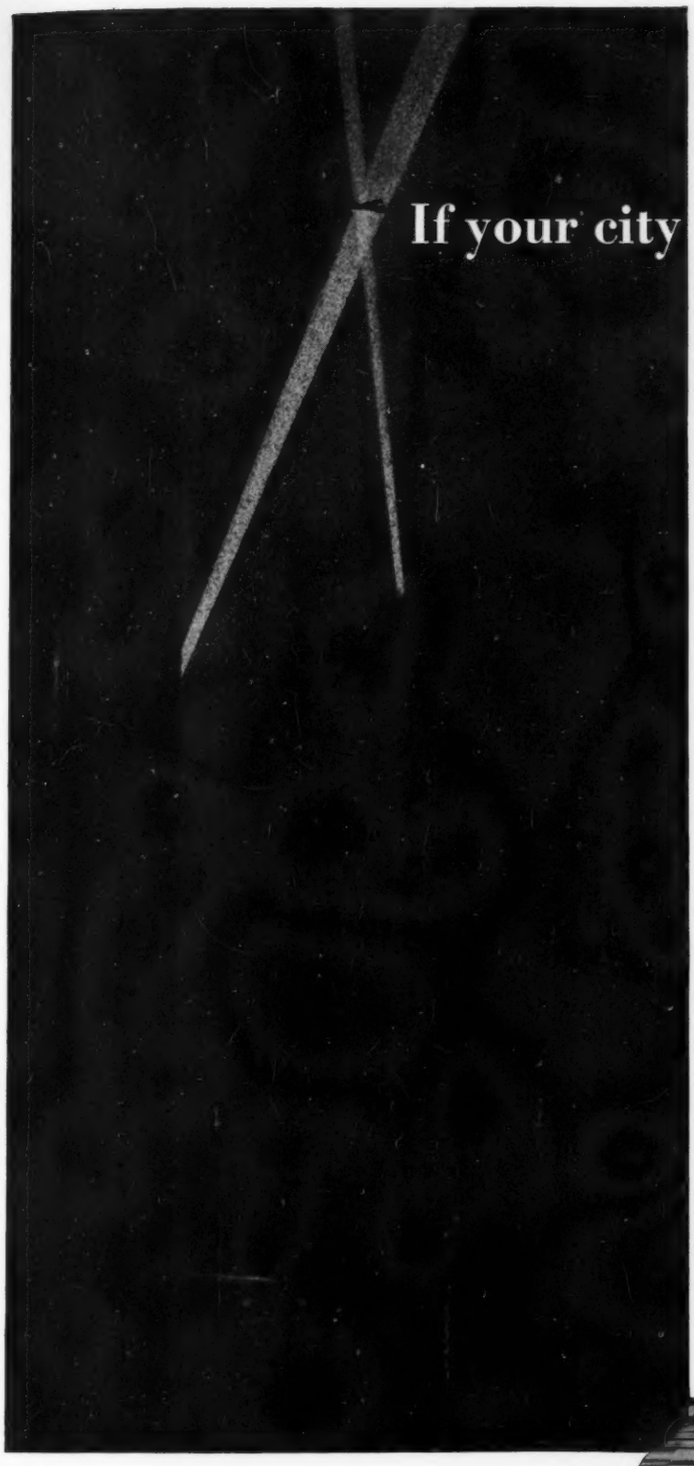


General view of Joint Meeting Treatment Plant at Elizabeth, N. J., with Link-Belt STRAIGHTLINE Grit Collectors and Washers in the foreground.

8937

LINK-BELT

SCREENS · COLLECTORS · AERATORS · GRIT CHAMBERS · MIXERS



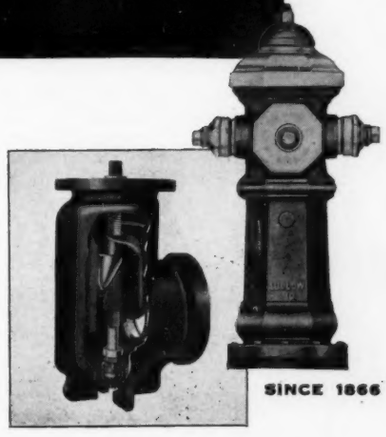
If your city were *bombed tonight...*

Would *all* your hydrants be ready for immediate service — prepared to deliver a quick, steady flow of water at many points? If they're Ludlow Hydrants, there can be only one answer — it's an emphatic YES!

Ludlow Hydrants afford the best protection against multiple flare-ups (such as caused by bombings) or routine fires. They respond instantly, yielding an abundant flow with minimum shock. Complete drainage at the lowest point prevents freezing. Wedge locking gate prevents flooding. Inspections may be made easily, without digging out parts beneath ground surface. Volunteer fire-fighters, with emergency training, find Ludlow Hydrants easy to operate. You'll find that they afford ideal protection for that new defense area in your community. Send for Catalog.

THE LUDLOW VALVE MFG. CO., INC.
TROY, NEW YORK

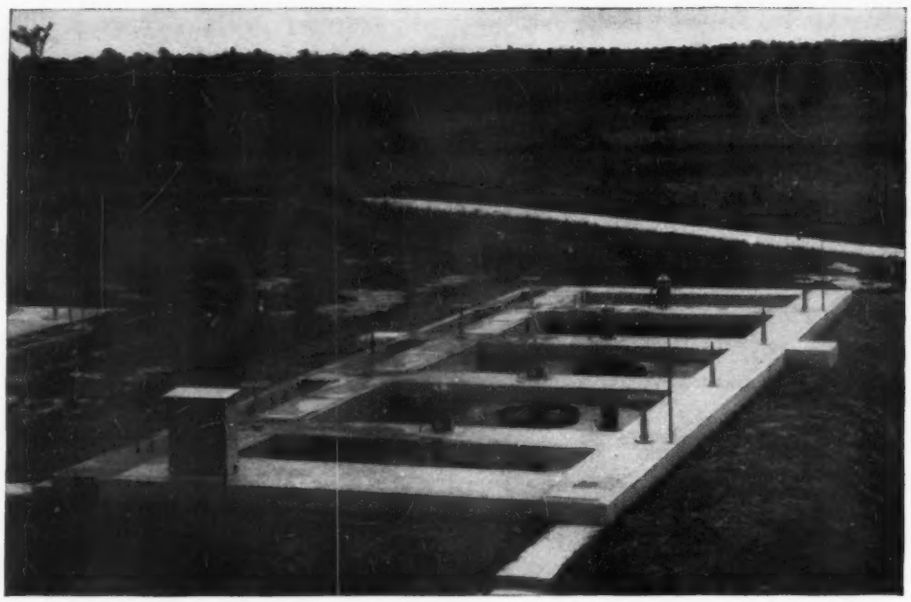
Ludlow Construction. Self-releasing 30° angle wedges and free-floating gates, self-adjusting to seats, afford smooth, trouble-free performance, long service. Opening and closing of hydrant automatically opens and closes drain, located at lowest point. Clogging is prevented. Gate is wedge-locked, when closed, to prevent flooding. All working parts may be lifted through top of hydrant for easy inspection. Top and bottom bodies bolted together at ground line.



LUDLOW HYDRANTS

"American"

GREASE FLOTATION AND PRETREATMENT



Battery of American Grease Flotation Units, Rocky Mount, N. C.
Consulting Engineers, J. E. Sirrine & Co., Greenville, S. C.

OPERATION RECORDS SHOW:

Additional BOD and suspended solids removal in Primary through beneficial aeration and grease removal.

Additional removal in filters through beneficial aerobic pre-treatment and reduction of BOD load to filter.

Ideal Aerobic conditions throughout the entire plant yields additional overall removal.

RECOMMENDED APPLICATIONS:

To expand the treating capacity of existing plants with a minimum of cost and use of materials.

To alleviate overloaded or over "greased" plants.

To cure septic primary settling tanks.

Typical Operating Results Rochelle, Ill.		
	5 Day BOD.	Grease
Raw. Sew.	342	142
Primary Eff.	112	40
Percent reduction	67	69
Results elsewhere comparable.		

NOTE: Installation of Grease Flotation units can often be made in existing primary tanks. No compressors or air lines are required.

V P.F.T. Equipment- Vital to War Program

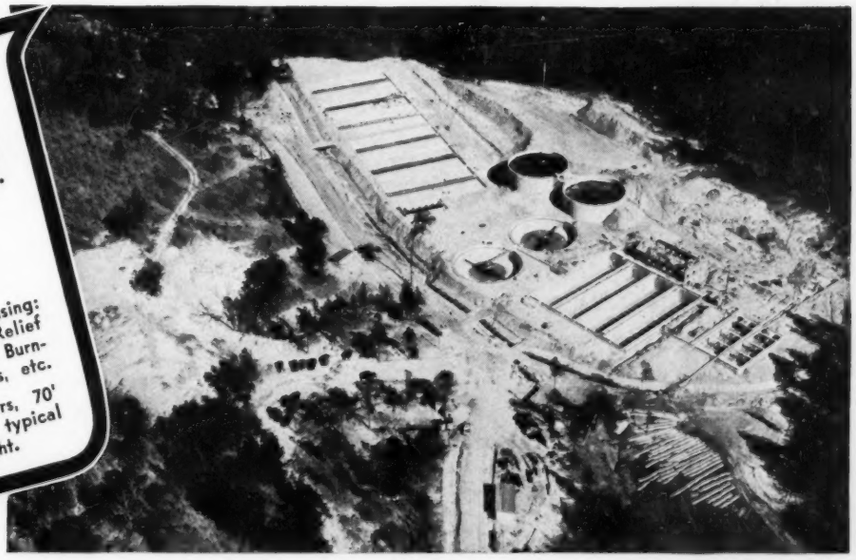
We have two great armies today in this country—the army that is learning the trade of war, and the army of civilian workers in shipyards, ordnance and munitions plants. The health and well being of both armies is essential to our ultimate victory, and modern, efficient sanitation facilities are being provided for their protection.

With more than half a century of specialization to serve as a background, P.F.T. Sewage Treatment Equipment is meeting every demand for fully safeguarding enlisted and civilian worker personnel. High ranking engineers and civil consultants recognize the merits of P.F.T.'s scientific, foolproof, trouble-free design and construction, giving it an acknowledged preference. The cooperation accorded all war projects by P.F.T. in the matter of swift production and delivery is another reason for choosing P.F.T. units.

The roster of war projects—army, navy, ordnance and aviation—served by P.F.T. Units grows from day to day. At the time this was written, 231 installations had been made. These include:

191 Floating Cover Digesters
78 Rotary Distributors
156 Siphon Installations
55 Sewage Sludge Pumps
171 Boiler Room Installations using: Flame Traps, Pressure Relief Flame Traps, Waste Gas Burners, Gages, Drip Traps, etc.

Two P.F.T. Floating Covers, 70' dia., at Camp Shelby—a typical installation—shown at right.

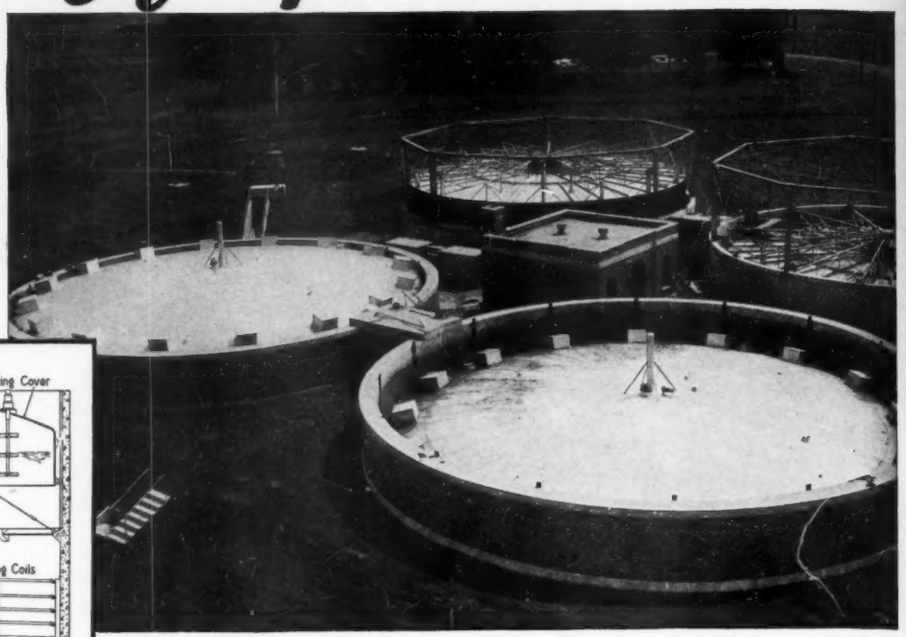


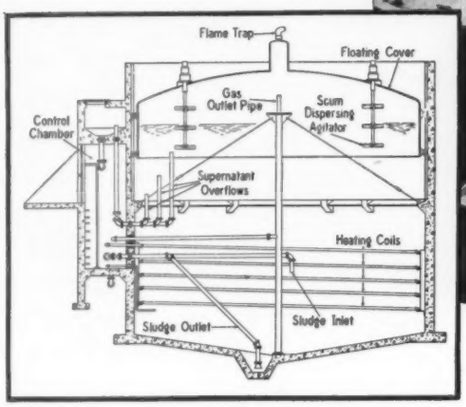
Exhibiting at the Third Annual Convention of the Federation of Sewage Works Associations.

PACIFIC FLUSH-TANK CO. 1892-1942 "50 YEARS of doing one thing well" SEWAGE TREATMENT EQUIPMENT

P.F.T. Pacific Flush-Tank Co.
4241 RAVENSWOOD AVENUE, CHICAGO
NEW YORK CHARLOTTE, N.C. LOS ANGELES
SEWAGE TREATMENT EQUIPMENT EXCLUSIVELY SINCE 1893

Sewage Equipment by GRAVER





- AERATORS
- AGITATORS
- AUTOMATIC DOSING SIPHONS
- CHEMICAL FEEDERS
- CHEMICAL PROPORTIONERS
- CHEMICAL TREATMENT PLANTS
- CLARIFIERS, PRIMARY AND SECONDARY
- COAGULATORS
- DIGESTERS
- GREASE REMOVAL EQUIPMENT
- GAS HOLDERS
- IMHOFF COMBINATION CLARIFIERS
- REACTIVATOR CLARIFIERS
- ROTARY DISTRIBUTORS
- SKIMMERS
- SLUDGE CONDITIONERS
- SLUDGE DRYERS
- SLUDGE FILTERS

A Complete Service and an Undivided Responsibility

Sanitation engineers know that the successful operation of a sewage plant depends upon the proper functioning of each of a myriad of parts which go to make up the whole. And further, that this is only accomplished by constant control in production from drawing board to installation.

Graver Sewage Equipment is completely designed and manufactured by Graver engineers and workmen. And behind these men are more than thirty years of experience in the design and manufacture of special equipment for thousands of institutions, industries, and municipalities, including more than ten years of experience with sewage equipment.

In selecting Graver equipment for the treatment of sewage you have the advantage of a complete service and an undivided responsibility, soundly based upon competent engineering and modern manufacturing methods.

Get the facts about this service today. Write for bulletin No. 311.

• Photo above shows, in foreground, two 75 feet diameter Graver Digester Floating Covers. Diagram shows sectional view of Graver Digester.

GRAVER

GRAVER TANK & MFG. CO., INC.

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CABLE ADDRESS — GRATANK

CHICAGO
TULSA

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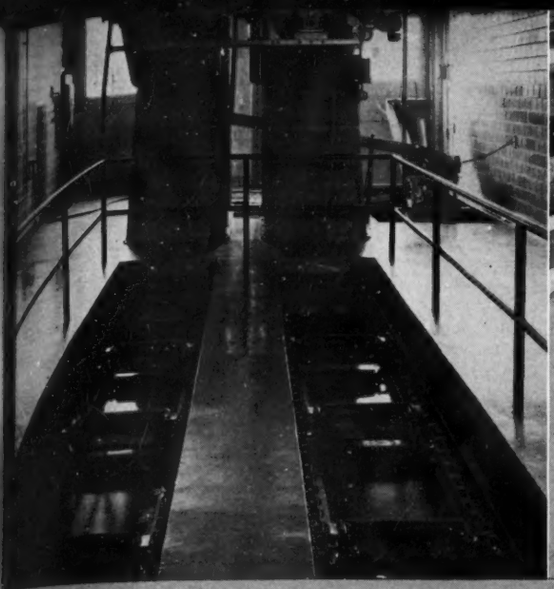


JEFFREY FOR THE RIGHT TREATMENT

Many Jeffrey-equipped sewage and water treatment plants in efficient operation all over the country, including those for air bases, cantonments, hospitals, etc., bear evidence that the correct treatment process and equipment was selected.

That's the point . . our Sanitation Engineers know the problems connected with sewage and water treatment . . know how from a wide experience to make recommendations to produce the best results. We'll be glad to diagnose your case.

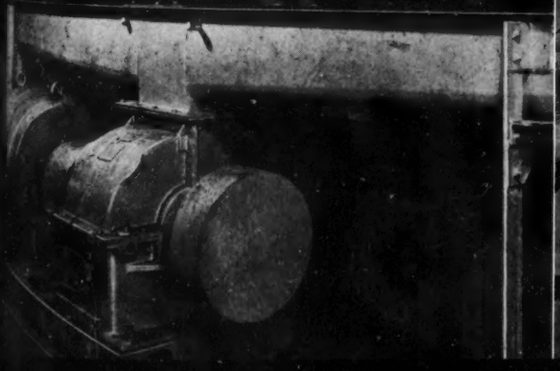
JEFFREY EQUIPMENT FOR SEWAGE AND WATER TREATMENT

Bar Screens
Chemical Feeders
Dried Sludge Grinders
Floctrols
Grit Collectors
Grit Washers
Screenings Grinders
Sludge Collectors
Sludge Elevators
(all patented)

THE JEFFREY MANUFACTURING COMPANY
996–99 North Fourth Street **Columbus, Ohio**

Baltimore	Chicago	Denver	Milwaukee	Scranton
Birmingham	Cleveland	Harlan	New York	Salt Lake City
Boston	Cincinnati	Houston	Philadelphia	St. Louis
Buffalo	Detroit	Huntington	Pittsburgh	

At top left may be seen a longitudinal view through two Jeffrey V-bucket grit collectors. Grit is flumed to No. 1 JIGRIT (grit washer) at right of collector housing. Top right—Jeffrey secondary settling tanks. Below left—Jeffrey screen and grinder combination for final disposal of sewage screenings. Below right—Jeffrey primary tanks with a close-up of the scum collector at effluent end.



Cleveland's Southerly Plant. See this Plant while in Cleveland.

Conference

ON WAR TIME SANITATION

(THIRD ANNUAL CONVENTION)

Federation of Sewage Works Associations

Meeting Place:—
Hotel Statler, Cleveland, Ohio

Dates:—
October 22nd to 24th, 1942

Chairman of Federation:—
A. S. Bedell, N. Y. State Health Dept., Albany

Chairman Convention Committee:—
Wm. L. Havens, Leader Bldg., Cleveland

Held in Conjunction with:—
Ohio Conference on Sewage Treatment

Exhibits:—
Exhibits by the leading manufacturers of sewerage and sewage treatment equipment, materials and supplies

Subjects:—
Impact of War on Sewage Treatment; Need for Short Training Schools During War Emergency; Operation of Sewage Plants in Military Camps; Wartime Sanitary Problems Facing State Health Depts.; Solving Cleveland's Sewage Problems; Treatment of Chemical Wastes; Sewage Works Priorities; Local Civilian Defense Problems; Sewage Works Maintenance in War Time; Value of Laboratory Tests in Plant Operation

Nationally-known Speakers — Discussions — Symposia

Inspections:—
Inspection of Cleveland's sewage treatment plants

Buffet Luncheon:—
Cleveland Sewage Treatment Plant

Reunion:—
Reunion of newly formed Quarter Century Club of operators

Entertainment:—
In keeping with war conditions, yet enough to permit get-together of friends and co-workers

Ladies Invited:—
Cleveland is an ideal city for pleasure, inspection, shopping and relaxation for wives and friends

Priorities Clinic:—
An important feature of the meeting . . . A clinic, manned by manufacturers' representatives and priority experts will give advice and guidance to members who are faced with equipment and supply problems

THE NATIONAL SEWAGE WORKS MEETING OF THE YEAR

(Space for this advertisement has been donated by
WATER WORKS AND SEWERAGE
in cooperation with attendance committee)

Conservation Sounds a Patriotic Call

CONSERVATION of meters is a patriotic duty. The Water Works Superintendent has a double conservation responsibility—first to conserve water and second, to conserve equipment. He must take steps to put water meters in "good as new" condition so that they can continue to curb waste and protect revenue.

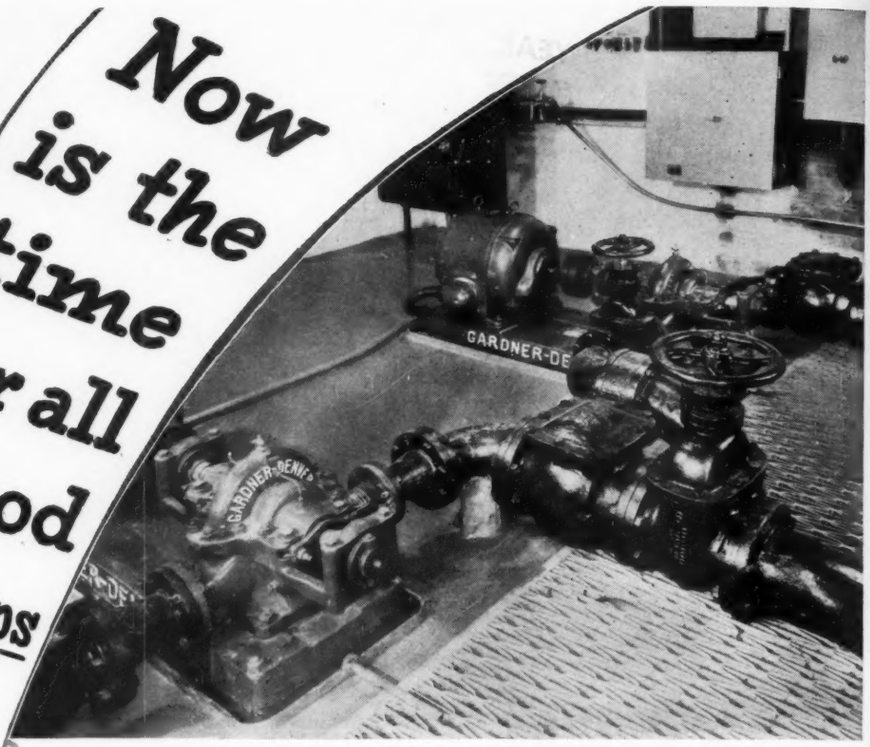
Those farsighted communities which invested in Badger Water Meters will be faced with less expense in their adjustment and repair programs. . . . Badger's low maintenance cost — as little as 1c per meter per year in many communities — is vital today — not only to present users but to those who are planning to put in meters to conserve water and save revenue.

BADGER METER MANUFACTURING CO., MILWAUKEE, WIS.

Branch Offices: New York City • Tampa, Fla. • Seattle, Wash. • Savannah, Ga. • Kansas City, Mo. Marshalltown, Iowa • Waco, Texas • Los Angeles, Cal. • Chicago Ill. • Philadelphia, Pa.

● *Gardner-Denver Double-Suction Horizontally Split Case Centrifugal Pumps are ruggedly built for large capacities at heads up to 350 feet.*

Now is the time for all good pumps



● **to guard against emergencies**—A Gardner-Denver centrifugal pump installation will help you weather emergencies—for these pumps "stand-by" with the reserve capacity for handling peak loads.

● **to deliver dependable performance**—If your pumps are Gardner-Denver, they are ruggedly constructed for heavy-duty pumping service. Vital castings of GarDurloy assure greater strength and resistance to wear. Heavy-duty, single-row ball bearings absorb line and thrust loads.

● **to operate efficiently**—The high efficiency ratings of Gardner-Denver centrifugals are the result of accurate impeller and casing design, and properly proportioned water passages. When doubtful water works engineers of a southern city put their Gardner-Denver pumps to a rigid test, the pumps met their rated efficiencies with ease.

● **to meet exacting specifications**—Designed with every proved hydraulic and mechanical advantage, Gardner-Denver centrifugals are truly modern pumps for today and tomorrow. Pump designs are tested with reliable and accurate testing equipment in Gardner-Denver's completely equipped testing laboratory.

● **to reduce cost per thousand gallons pumped**—The dependability and high efficiency of Gardner-Denver centrifugals enables them to hold down power cost per thousand gallons pumped—and that's good news for many a water works budget today!

For complete specifications, write to Gardner-Denver Company, Quincy, Illinois

GARDNER-DENVER PRODUCTS HELP SPEED VICTORY

GARDNER-DENVER *Since 1859*

To help you make
MOST EFFECTIVE USE
of your Alkalies

Call

DIAMOND
TECHNICAL SERVICE

We offer the services of an experienced staff of technicians to help you make your raw materials go farther. Skilled in the use of Diamond Alkali products for a wide variety of applications, these experts help make most effective use of not only alkalies, but of other materials as well. Thus they can assist you in one of your most vital obligations today—conserving America's resources!

DIAMOND ALKALI COMPANY

PITTSBURGH, PA. *and Everywhere*

ALKALI

TO EXECUTIVES:

NOW YOU CAN HELP

Even More...

New Treasury Ruling Permits Purchases UP TO $100,000, in any Calendar Year, of Series F and G WAR BONDS!

The Treasury's decision to increase the limitations on the F and G Bonds resulted from numerous requests by purchasers who asked the opportunity to put more money into the war program.

This is not a new Bond issue and not a new series of War Bonds. Thousands of individuals, corporations, labor unions, and other organizations have this year already purchased $50,000 of Series F and G Bonds, the old limit. Under the new regulations, however, these Bond holders will be permitted to make additional purchases of $50,000 in the remaining months of the year. The new limitation on holdings of $100,000 in any one calendar year in either Series F or G, or in both series combined, is on the cost price, not on the maturity value.

Series F and G Bonds are intended primarily for larger investors and may be registered in the names of fiduciaries, corporations, labor unions and other groups, as well as in the names of individuals.

The Series F Bond is a 12-year appreciation Bond, issued on a discount basis at 74 percent of maturity value. If held to maturity, 12 years from the date of issue, the Bond draws interest equivalent to 2.53 percent a year; computed on the purchase price, compounded semiannually.

The Series G Bond is a 12-year current income Bond issued at par, and draws interest of 2.5 percent a year, paid semiannually by Treasury check.

Don't delay—your "fighting dollars" are needed *now.* Your bank or post office has full details.

Save With . . .

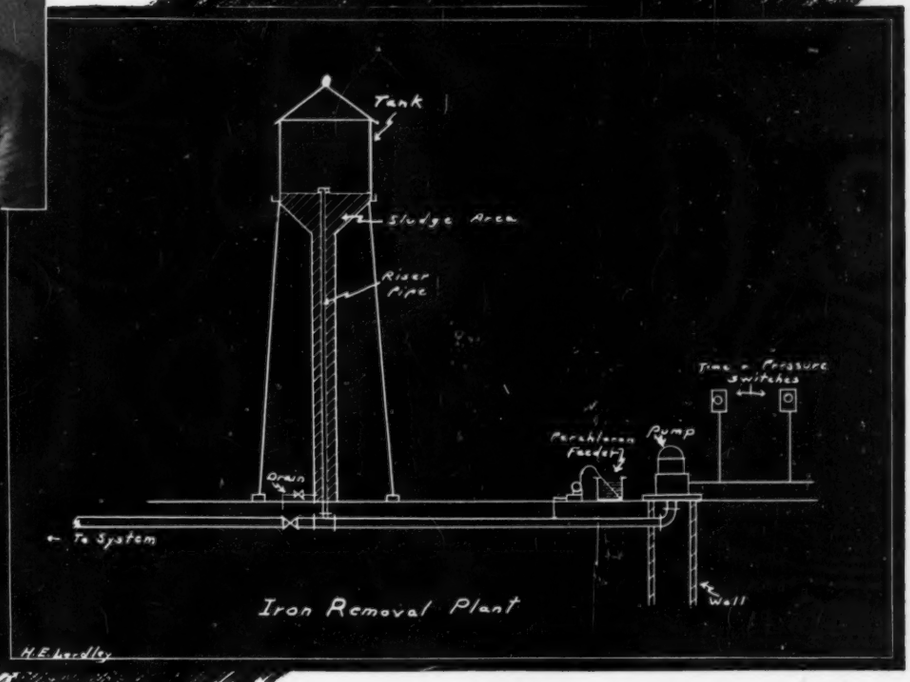
War Savings Bonds

This space is a contribution to America's All-Out War Program by WATER WORKS AND SEWERAGE

Perchloron does three important jobs in Virginia

REG. U.S. PAT. OFF.

H. E. Lordley, Plant Manager



According to [illegible] E. Lordley, a waterworks engineer in Virginia, Perchloron proved an unusually valuable source of chlorine by doing triple duty in a small community near Richmond. Here's Mr. Lordley's Perchloron case history in his own words:

"Many of the deep-well supplies serving small communities in eastern Virginia not only show bacterial pollution but also have hydrogen sulphide and ferrous iron. In one case, the well water had an iron content of 6 p.p.m. plus hydrogen sulphide which precipitated as iron sulphide in the distribution system, and customers received black water.

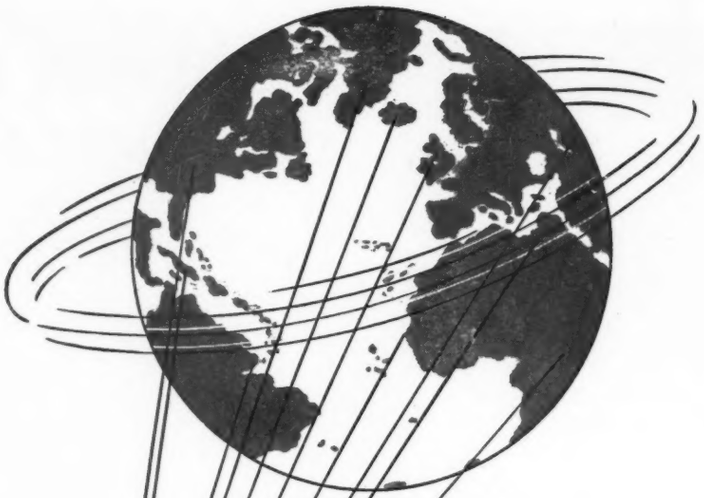
"On investigation, I found that a simple treatment of only 3 p.p.m. chlorine would oxidize the iron, remove the hydrogen sulphide, and deliver a sterile water having a residual chlorine of 0.20 p.p.m. Since it was not practical to use liquid chlorine on such a small supply, Perchloron was used, and the solution was fed into the system by a Chlor-O-Feeder.

"The water consumed by the system after ten p.m. was negligible, so that the pump and feeder could both be started by a time clock every night, and all the water was then pumped into the storage tank. In this tank, the riser pipe extended about five feet above the bottom, so that the oxidized iron and sludge settled to the bottom of the tank and were drawn off through a waste valve once a week. By five a.m. the water had settled, and the clear water flowed to the customers with no hydrogen sulphide, no bacteria, and only 0.5 p.p.m. iron as ferric oxide, all without the aid of filters.

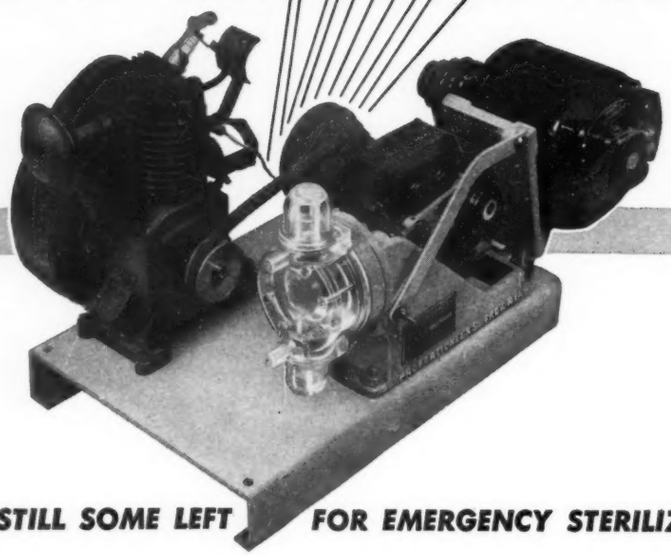
"Here Perchloron did three big jobs, and the community received safe water for only a few cents per million."

Perchloron, with 70% available chlorine, is readily dissolved, keeps well and offers you an excellent standby source of chlorine. It comes in handy 5-lb. cans with airtight covers, 9 to the case; and in 100-lb. drums. Write Dept. WS for *free* illustrated booklet.

Perchloron is, of course, being used for direct defense purposes and is being supplied regularly to the Government. While this makes it impossible for us to deliver normal quantities to our customers, we want you to know the facts, believing that you will cooperate with us by ordering only your immediate needs. We hope too that you will avail yourself of the services of the Penn Salt representative nearest you who may be able to help you in meeting today's unusual problems.



GLOBAL WATER PROTECTION FOR THE MEN OF OUR ARMED FORCES...



AND STILL SOME LEFT FOR EMERGENCY STERILIZATION!

One of the interesting stories to be told after the war is that of the efforts made to protect the health of our armed forces as they fought all around the Globe. % Proportioneers % is proud that their equipment is doing its share in safeguarding drinking water supplies at bases, forts, camps, and with forces on the march.

We are happy, too, that some of our facilities are available for emergency duty on the home front. The Dual Drive Chlor-O-Feeder illustrated is playing a leading part in this emergency program; actively supported by meter operated main sterilizers, all hydraulic feeders, and the Blitz-Buggy trailer unit.

It will pay you to bring your particular problem to

"EMERGENCY CHEMICAL FEEDER HEADQUARTERS"

—or just ask us to send you new Bulletin EMM. Address—

% PROPORTIONEERS, INC. %

9N Codding St. **Providence, R. I.**

WATER WORKS & SEWERAGE

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330 South Wells Street, Chicago, Ill.
E. S. Gillette, Publisher

EDITORIAL OFFICE
155 East 44th Street, New York, N. Y.
L. H. Enslow, Editor

COMING!

"Elevated Tank Maintenance and Repairs"

Is another article in keeping with the spirit of the day. Never was America more conscious of maintenance, so WATER WORKS AND SEWERAGE is making a particular effort to give its readers timely and up to date information and pointers on effective repair and maintenance practices. Especially at this time, when there is an opportunity and a *real* need for catching up on maintenance work, should these articles prove helpful to all who have a genuine desire to "Stretch, Save and Share." We heard the author of this article speak informally on tank maintenance so we prevailed upon him to put his comments and suggestions on paper. He is—

JOHN M. PERRYMAN, Engineer,
R. D. Cole Mfg. Co., Newnan, Ga.

"Mechanical-Electrical Maintenance of Sewage Plants"

Is an extremely timely contribution in a period when effective and continuous maintenance and repair programs at water and sewage plants have never before rated the importance that they do today. The manifold uses of welding methods used in rehabilitating worn or damaged parts of equipment in the Twin-Cities Sewage Treatment Plant is an outstanding example of what can be accomplished with a minimum requirement of skilled labor and materials. This, however, is just one of the many economy and conservation producing maintenance practices at the St. Paul plant, recounted by—

STANLEY J. LARSEN, Mechanical Eng'r,
The Minneapolis-St. Paul Sanitary District.

"Rates and Rate Making"

Is always an intriguing subject. After a study of rates and rate making in water works practice an informative and interesting article is being developed by—

MARVIN P. HATCHER,
Chief Eng'r and Sup't,
Water Department, Kansas City, Mo.

"The Theory and Practice of Sludge Digestion Tank Heating"

Is a topic on which too little information exists. Heat losses and heat conservation in sludge digestion are discussed and analyzed by an engineer and student who needs no introduction to the readers of WATER WORKS AND SEWERAGE. Those who have read his earlier articles will be on the lookout for this one by—

NORMAN C. WITTWER,
Former Plant Manager and Consulting Engineer,
Now Captain with the U. S. Engineers.

"The Design and Operation of Sludge Digestion Tanks for Efficient Gas Production"

Is something of a companion article to the preceding article. This one is the contribution of a plant operator who has noted the performance of heated sludge digestion tanks and given considerable thought to improvements in the matter of heat input to digesters and the conservation of such heat input through improved design and operation. He is—

ALBERT B. KOZMA, Sup't,
Sewage Treatment Works, Rutherford, N. J.

"The Care and Maintenance of Distribution Systems"

Is a paper which an experienced and progressive manager of a well operated water utility of moderate size was asked to prepare for use in operator's short schools. We consider it a well rounded out contribution which will prove of interest and value to operators of all sizes of water utility systems, and particularly so to the small system manager and those who have had limited operating experience. The author brands it as "elementary," but it is just the type of paper which we have been seeking for the benefit of our newer readers. The author—

FRANK C. AMSBARY, JR., Supt.,
Illinois Water Service Co., Champaign, Ill.

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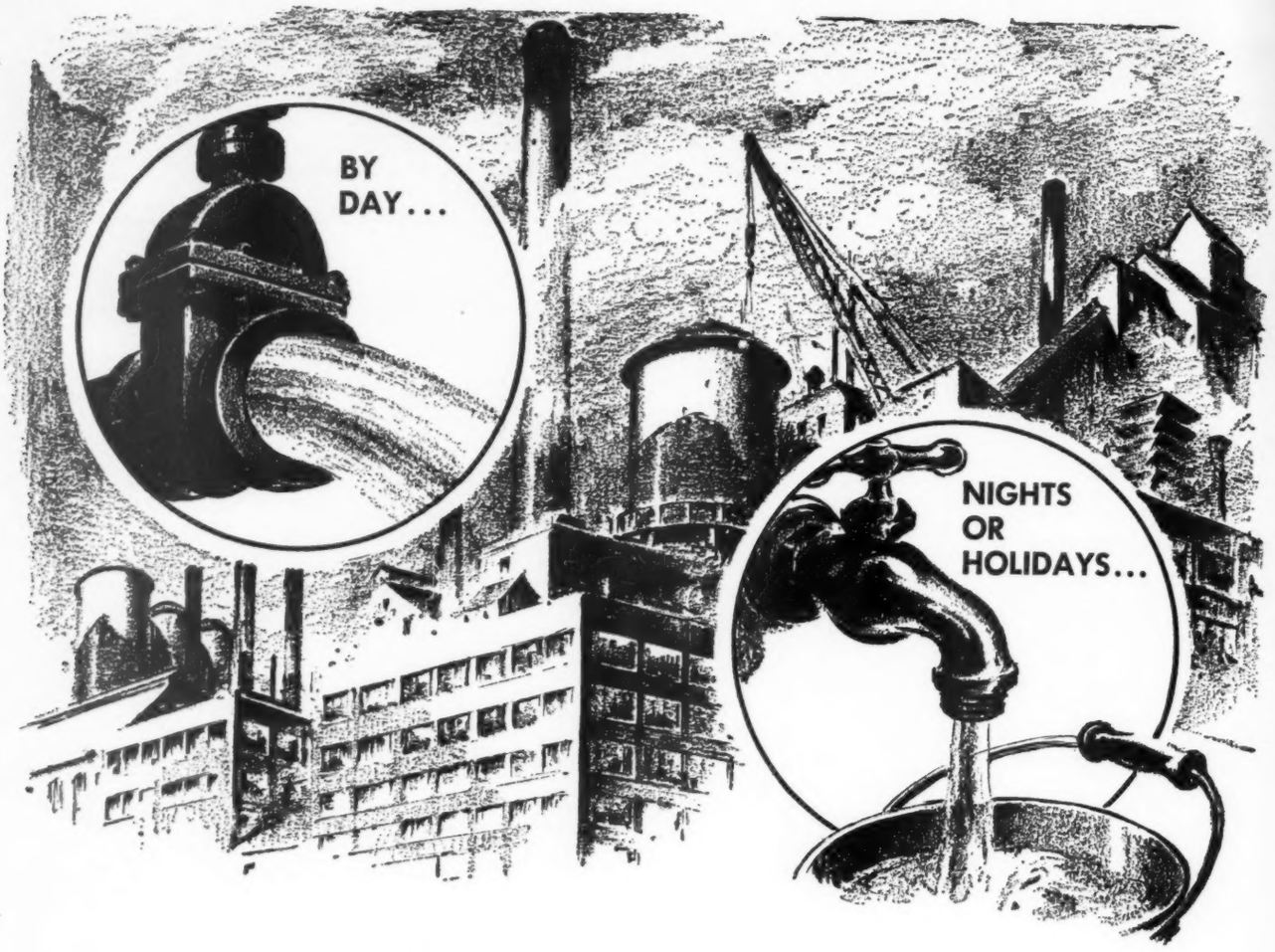

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WATER WORKS & SEWERAGE

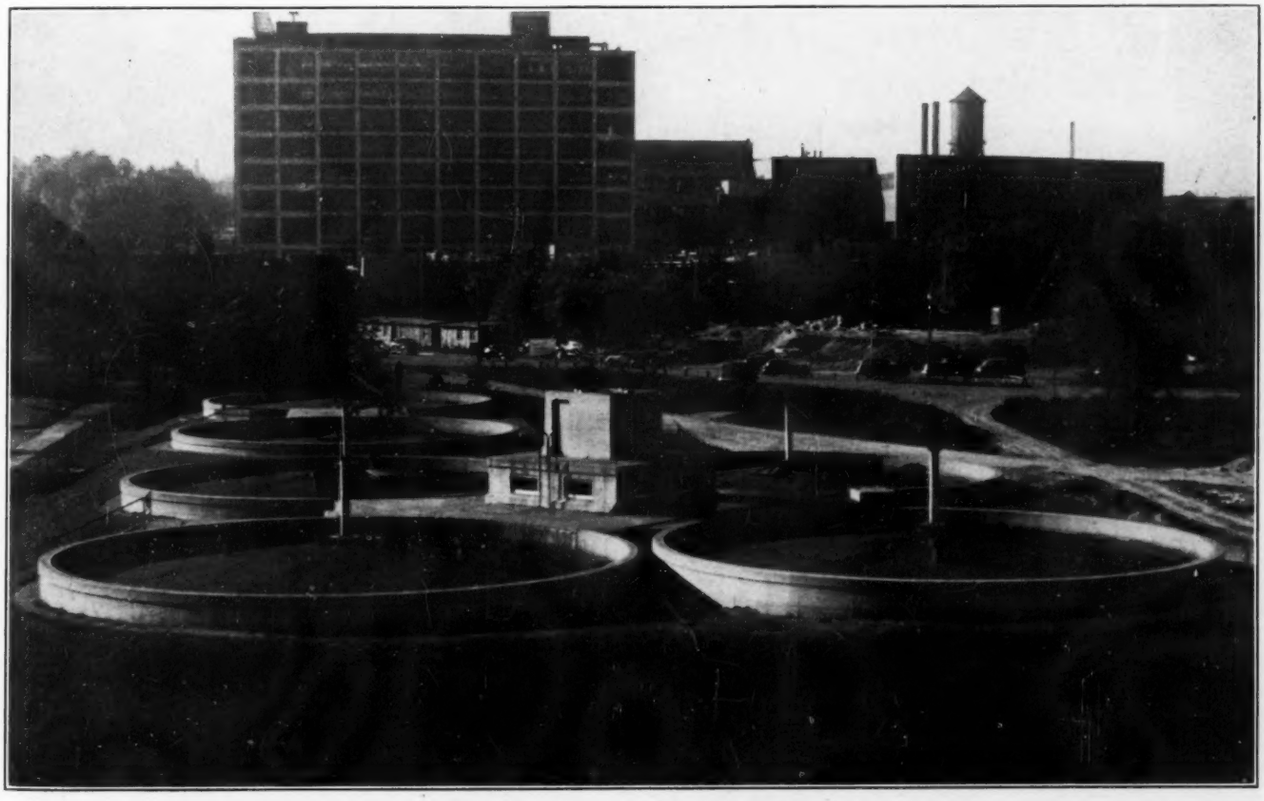
VOL. 89, No. 10 *A Gillette Publication* OCTOBER, 1942

SLUDGE DIGESTION

Design Studies, Observations and Developments at Cleveland, Ohio

By WALTER E. GERDEL
Superintendent
WESTERLY SEWAGE TREATMENT PLANT
CLEVELAND, OHIO

HEATED separate sludge digestion operations were started in Cleveland at the Westerly Sewage Treatment Plant in 1933. The unit that was built and utilized for this purpose consisted of two fifty-foot diameter tanks with floating covers and outside gas line takeoffs. This unit having a total capacity of 96,000 cubic feet was operated as a full sized pilot plant for a number of years, and important data and information were obtained that were used in the later design of additional digesters at the Westerly Plant, and two units of six digesters each at the Southerly Sewage Treatment Plant of the City of Cleveland. It is noteworthy that the original sludge digestion unit at the Westerly Plant is and has been functioning smoothly all these years, and at the present time is carrying greater solids loads than ever before. The only important changes that have been found advisable have been an increase in the size of the gas piping, replacement of the old flame traps by those of improved design, and the installation of additional waste gas burners.



Westerly Digesters—Cleveland, Ohio
(From Roof of Filtration and Incineration Building)

In 1936, four additional digesters were put in operation at the Westerly Plant, and in 1938, twelve hexagon-shaped floating cover digesters, 96 feet across the sides, were put in operation at the Southerly Sewage Treatment Plant.

Digestion on Huge Scale

At the present time, Cleveland has 2,700,000 cubic feet of heated separate digestion tank capacity. This is probably greater than that of any other city or sewerage district in this country. Such digestion capacity represents an investment of a little more than a million dollars, and constitutes one of the most important processes in the Cleveland sewage treatment plants. The sludge which is removed from about 120 M. G. D. of sewage is processed in the digesters. Thirty M. G. D. of this sewage receives only primary sedimentation as the treatment, and the remainder receives complete treatment by the activated sludge process at the Easterly Plant and trickling filters at the Southerly Plant.

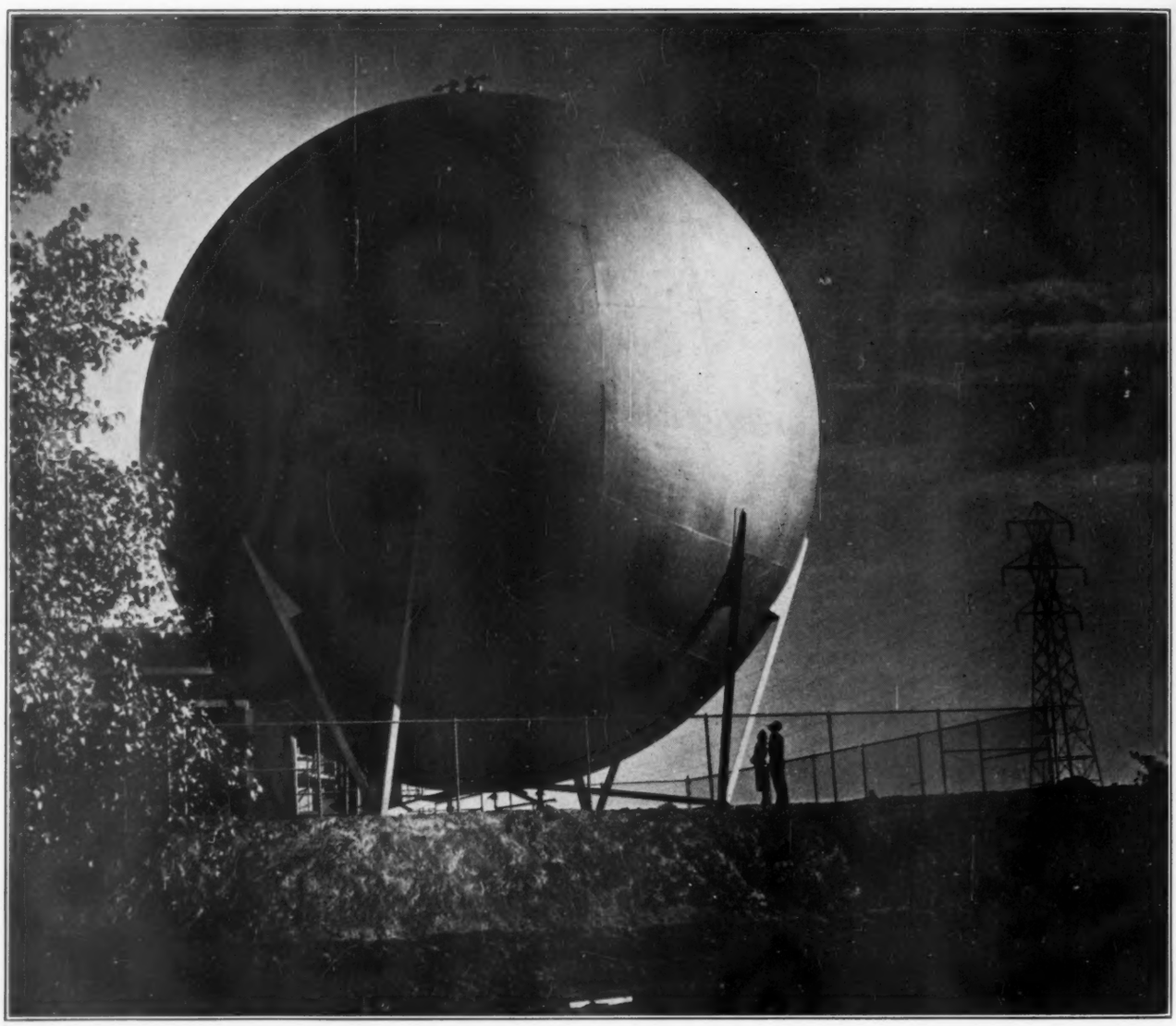
As an index of the importance of sludge digestion to the Cleveland plants, the following data for 1940 show the dry solids loading and the gas production for the combined plants.

Average daily dry solids loading.....243,000 lbs.
Average daily gas production (metered) 1,124,000 cu. ft.

During the past five years, the digesters at the Westerly Plant have been operated under close supervision and laboratory control, with the intent of evaluating more fully the character of the digestion process and the conditions under which it works best. More than ordinary care has been taken in the necessary volume measurements, meter readings, sampling, and analytical laboratory procedures. Metered gas volumes have been converted to standard conditions and the necessary data to do this have been collected. Incidentally, it has been found in connection with the conversion of gas volumes to standard conditions, that the moisture content of the gas at the meters will vary from practically zero to 100 per cent of saturation, depending on a number of variable factors.

Westerly Treatment

The sewage received at the Westerly Plant is considered rather strong and contains considerable quantities of industrial waste—notably packinghouse and stockyard material. The treatment is primary in nature and consists of screening, detrition, grease separation by aeration, and sedimentation by passage through Imhoff tanks. From the latter units the settled solids are removed as fresh as possible. That is, the Imhoff units are operated as separatory devices to



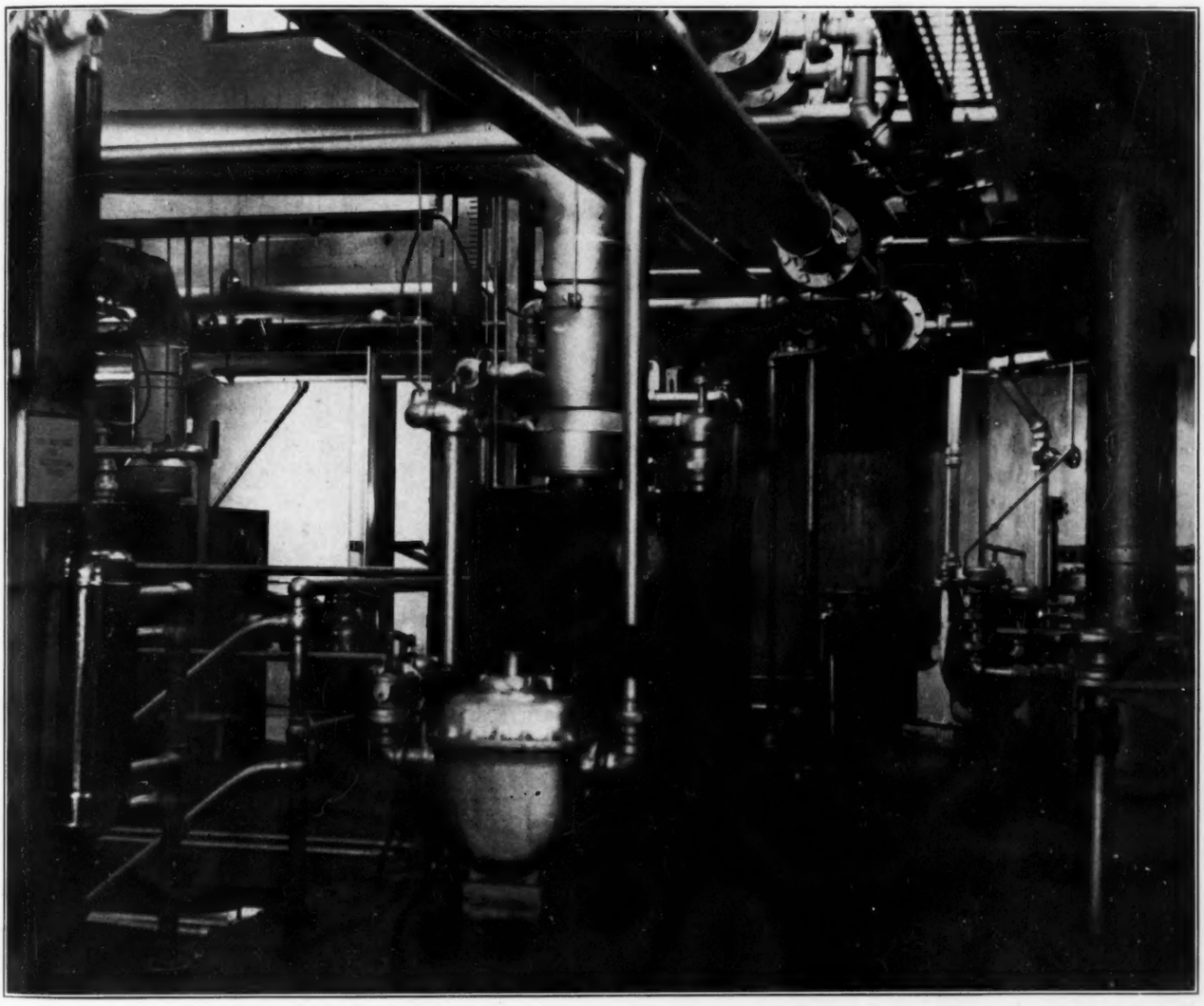
Gas Storage Pressure Sphere

feed the digestion tanks. During the summer months, prechlorination of the raw sewage, and post-chlorination of the Imhoff tank effluent is practiced. It might be stated that although every effort is made to remove all solids which settle out in the Imhoff tanks as soon as possible, some digestion takes place here and at times causes gas vent foaming nuisance. From the digesters the resulting digested is passed to a sludge storage tank from which it is drawn for conditioning with lime and ferric chloride and dewatering on vacuum filters. The greater portion of the resulting filter cake is incinerated in multiple hearth type incinerators, although an appreciable amount is taken away by the public, free of charge, and used as a soil conditioner.

Sludge digestion is effected in six tanks, each equipped with a floating cover. The tanks are fifty feet in diameter, twenty-two feet sidewall depth, and twenty-eight feet deep at the center of the conical hopper. There are two sludge control chambers which house the sludge pumps, gas-fired hot water heaters, gas pressure booster pumps, meters, flame traps and other auxiliary equipment. The four newer digestion tanks have float-operated indicators to show the total contents of the tanks at any moment. Incidentally, these indicators materially simplify the task of account keeping in the matter of quantity of sludge charged and withdrawals of supernatant and digested sludge. The tanks are heated by means of hot water circulated through tiers of two inch chrome-nickel-iron pipe hung on the sidewalls.

Gas Handling and Use

The gas produced is either wasted at the waste gas burners or is pumped into the pressure header and made available for use over the entire plant. Gas pressure booster pumps, automatically controlled by means of mercoid pressure switches, boost the gas pressure from two to five inches water column pressure at the digesters to not over twenty inches water column pressure in the pressure header. A spherical, pressure-gas holder, capable of delivering 50,000 cubic feet of gas, floats on the plant gas system. At times when there is an abundance of gas and the gas holder is below maximum pressure, gas compressors pick up gas from the plant system and discharge it into the gas holder; when the gas production is low, and the pressure in the plant system falls below a minimum set pressure, then the gas holder automatically delivers gas back into the system.



Upper Portion Digester and Gas Control Chamber
(This chamber serves the four newer digesters at the Westerly Plant. Sludge pumps are in the basement)

Operation Data

Table No. 1, Sludge Solids Balance, summarizes the overall results obtained during the five-year period from 1937-1941. The results indicate that the raw sludge removed at the Westerly Plant will produce approximately 17.5 cubic feet of gas per pound of dry solids destroyed. This amounts to 1.21 pounds of gas per pound of dry solids destroyed. The data indicate that the overall reaction which takes place is one in which water unites with organic material to produce gas. The fact that considerable grease skimmings, containing large quantities of animal and vegetable fats, are removed from the Imhoff tank surfaces and are pumped to the digesters for conversion to gas is an additional reason why such a reaction is likely to have taken place. The +3.08 percentage of sludge volume unaccounted for is attributed mainly to rainfall which entered the tanks.

[Tables No. 2, 3, 4, 5, and 6 give in detail data concerning the raw sludge, gas production, digested sludge, supernatant liquor and heating of the digesters.]

Table No. 7 submitting loading data, expresses the loading in the conventional pounds of total dry and volatile solids per month per cubic foot digestion capacity, and also in terms of gas produced in cubic feet per month per cubic foot of digestion capacity. It is felt that the gas production figure is a newer and better index to the work actually being done by the digesters as it is in direct relationship to the digestible volatile contents of the raw sludge.

Sampling Procedure

Generally, a sample of each sludge and supernatant liquor withdrawal is taken from each tank. A daily fresh sludge composite is also taken of the entire day's charging. Sampling is done at frequent intervals, and proportionate volumes are taken to assure representative samples. The sampling procedures are checked periodically, as it has been our experience that no matter how much these are emphasized, there is a tendency to become careless and bring in samples that are not representative.

Table 1

Separate Sludge Digestion—Solids Balance—All Digesters Combined
For the Period of 1937 to 1941, Inclusive
(Westerly Treatment Plant)

ITEMS	Thousands of Gallons	Thousands of Pounds of Solids Total	Volatile	Ash	% Volatile Solids
1. Additions during period	86,499	50,181	32,920	17,261	65.6
Withdrawals					
2. Gas—Thousands of cubic feet	293,736 at S.C.	20,268	20,268	.....	100.00
3. Supernatant liquor	39,698	1,593	786	807	49.3
4. Digested sludge	49,569	31,652	15,470	16,182	48.9
5. Total accounted for	89,267	53,513	36,524	16,989	...
6. Unaccounted for	+2,668	+3,332	+3,604	—272	...
7. Per cent unaccounted for	+3.08	+6.64	+10.95	—1.58	...
8. Total digestion loss	.....	16,936	16,664	.....	...
9. Per cent total digestion loss	.....	33.75	50.62	.....	...
10. Gas per lb. solids added	.....	5.85	8.92	.....	...
11. Gas per lb. solids destroyed	.....	17.34	17.63	.....	...
12. Pounds of gas formed, per lb. matter destroyed	.....	1.20	1.22	.....	...

No solids inventory taken either before or after the period, it being assumed that the solids contents of the digestion tanks being the same at both times.

Table 2

Raw Sludge Additions to All Digesters—1937-1941
(Westerly Treatment Plant)

Year	Number of Additions	Total Gallons in Thousands	Thousands of Pounds of Solids Total	Volatile	Temp. F.	% Total Solids	% Volatile Solids	pH	Alk. as $CaCO_3$ P.P.M.
1937	823	13,981	8,175	5,650	58	6.90	70.4	6.1	740
1938	641	13,116	7,525	5,064	58	6.80	67.7	6.4	820
1939	857	17,405	10,372	6,447	59	7.01	62.2	6.7	1,070
1940	892	19,038	11,373	7,465	61	7.03	65.6	6.7	1,060
1941	925	22,959	12,736	8,294	62	6.52	65.1	6.7	1,020
Total	4,138	86,499	50,181	32,920	298	...	...	32.6	4,710
Maximum	925	22,959	12,736	8,294	62	7.03	70.4	6.7	1,070
Minimum	641	13,116	7,525	5,064	58	6.52	62.2	6.1	740
Average	828	17,300	10,036	6,584	60	6.83	65.6	6.5	940

Note: All sludge calculated at 8.50 pounds per gallon. Raw sludge includes fresh solids, grease skimmings and gas vent scum.

Table 3

Gas Production— All Digesters Combined—1937-1941
(Westerly Treatment Plant)

Year	Total Gas Metered Thousands of Cubic Ft.	Conversion Factor to Standard Conditions	Total Gas at Standard Conditions, Thousands of Cubic Ft.	Gas Produced in a Day Cu. Ft. at S. C. Average	Maximum	Total Gas Produced, Thousands of Lbs.	Carbon Dioxide in Gas %	Cu. Ft. Gas at Standard Cond. per Lb. Volatile Solids Added
1937	60,707	0.8813	53,273	146,000	269,100	3,676	...	9.80
1938	53,286	0.8815	47,036	128,900	226,600	3,245	30.6	9.76
1939	66,787	0.8696	58,079	159,100	288,000	4,008	31.2	9.01
1940	76,826	0.8810	67,687	184,900	357,200	4,670	29.6	9.07
1941	76,339	0.8863	67,661	185,400	370,300	4,669	29.1	8.16
Total	333,945	.....	293,736	.....	.....	20,268	120.5	...
Maximum	76,826	0.8863	67,687	185,400	370,300	4,670	31.2	9.80
Minimum	53,286	0.8696	47,036	128,900	.....	3,245	29.1	8.16
Average	66,789	0.8796	58,747	160,900	.....	4,054	30.1	8.92

Table 4
Digested Sludge Drawn from All Digesters Combined—1937-1941
(Westerly Treatment Plant)

Year	Number of Withdrawals	Thousands of Gallons	Thousands of Pounds of Solids		Temp. F.	Total Solids %	Volatile Solids %	pH	Alkalinity as Ca CO_3 P. P. M.
			Total	Volatile					
1937	153	6,588	4,673	2,274	91	8.10	50.0	7.3	3,470
1938	142	5,706	3,952	1,987	95	8.11	50.3	7.3	3,830
1939	343	8,028	5,911	2,613	94	8.62	44.2	7.3	3,530
1940	416	12,600	8,050	4,009	88	7.48	49.8	7.3	3,280
1941	497	16,647	9,066	4,587	87	6.38	50.6	7.3	2,810
Total	1,551	49,569	31,652	15,470	455	...	...	..	16,920
Maximum ..	497	16,647	9,066	4,587	95	8.62	50.6	7.3	3,830
Minimum ..	142	5,706	3,952	1,987	87	6.38	44.2	7.3	2,810
Average ...	310	9,914	6,330	3,094	91	7.48	48.9	7.3	3,380

Note: All digested sludge calculated at 8.54 pounds per gallon.

Table 5
Supernatant Liquor from All Digesters Combined—1937-1941
(Westerly Treatment Plant)

Year	Number of Withdrawals	Thousands of Gallons	Thousands of Pounds of Solids		Temp. F.	Total Solids %	Volatile Solids %	pH	Alkalinity as $CaCO_3$ P. P. M.
			Total	Volatile					
1937	182	7,318	168	79	94	0.29	46.8	7.3	3,300
1938	158	7,664	242	123	94	0.38	50.9	7.3	3,300
1939	228	9,769	423	206	96	0.52	48.8	7.3	3,270
1940	176	7,387	408	206	91	0.66	50.5	7.3	3,200
1941	161	7,560	352	172	90	0.56	48.9	7.3	2,720
Total ...	905	39,698	1,593	786	465	...	...	..	15,790
Maximum .	228	9,769	423	206	96	0.66	50.9	7.3	3,300
Minimum ..	158	7,318	168	79	90	0.29	46.8	7.3	2,720
Average ...	181	7,940	319	157	93	0.48	49.3	7.3	3,160

Note: All supernatant calculated at 8.33 pounds per gallon

Table 6
Heating of All Digesters Combined—1937-1941
(Westerly Treatment Plant)

Year	Water Circulated in Thousands of Gallons	—Temperature of Circulating Water— In F.	Out F.	Difference F.	Gas Burned in Heaters Thousands Cu. Ft.*
1937	35,218	126	106	20	10,272
1938	32,314	123	104	19	9,410
1939	34,383	131	109	22	12,020
1940	33,303	133	109	24	11,995
1941	33,856	132	108	24	12,070
Total	169,074	645	536	..	55,767
Maximum	35,218	133	109	..	12,070
Minimum	32,314	126	104	..	9,410
Average	33,815	129	107	22	11,153

*Volume at standard conditions.

Table 7
Combined Digester Loadings—1937-1941
(Westerly Treatment Plant)

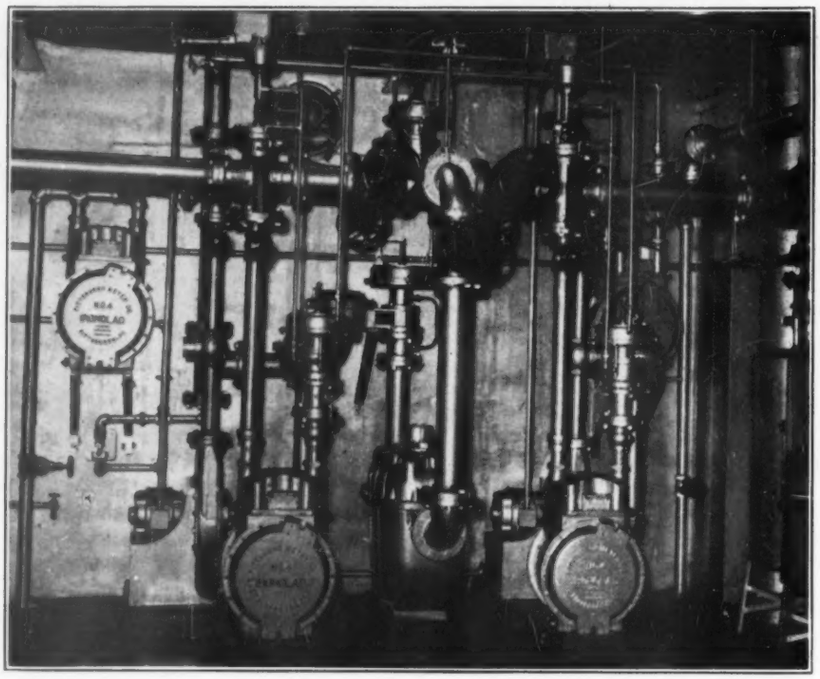
	Average for 5-Year Period	Maximum Month Loading
Pounds of dry solids per month per cu. ft. digestion capacity.....	2.90	5.03
Pounds of volatile solids per month per cu. ft. digestion capacity.....	1.91	3.30
Cu. ft. of gas per month per cu. ft. digestion capacity.....	17.0	31.5

Schedule of Operations

The digesters have generally all been operated as primary digesters, although there have been periods when an arrangement utilizing secondary digestion also has been used. The operating schedule calls for the odd-numbered tanks to be charged on alternate days starting on Mondays. The even-numbered tanks are charged on alternate days starting on Tuesdays. No charging or withdrawal of sludge or supernatant liquor is done on Sundays. This schedule of operations allows each digester a two-day period each week during which there is no charging, and it has been very conducive to obtaining clear supernatant liquor immediately following the two-day non-charging period. It has been our policy to withdraw at all times all of the supernatant liquor possible, and to retain the digested sludge for as long as possible.

Because of seasonal conditions, and due to the fact that the Imhoff tanks accumulate solids in the gas vents during the winter months that cannot be drawn off until warmer weather, the solids loadings and resultant gas production vary considerably during the twelve months of the year, and are always at a maximum during the summer months. As an illustration, the maximum monthly gas production in 1941 was 9,075,000 cu. ft., while the minimum monthly gas production was 3,272,000 cu. ft.

Originally the scheme of operations of the sludge filtration-incineration unit, which was started in 1938, called for the removal of digested sludge directly from the digesters to the filtration sludge sump. This method of operation, however, ties the two units too closely together and any unusual occurrence or maintenance difficulty in the filtration-incineration unit immediately affects the digestion unit operation. In order to over-



Upper Portion of First Digester and Gas Control Chamber
(Hot water heaters, circulating pumps and sludge pumps are located in basement)

come this difficulty and to provide the desirable flexibility, one of the Imhoff tanks was taken out of service as a sewage sedimentation tank and converted into a sludge storage tank. Besides acting as an expansion tank between the two units, it serves to provide a more uniform and composited digested sludge with higher solids content than would otherwise be the case.

Control of Process

Samples of raw sludge, digested sludge and supernatant liquor are analyzed in the laboratory for total solids, volatile solids, pH and alkalinity. The digester gas is analyzed for carbon dioxide and per cent saturation of water vapor. These data are used for both record and control purposes. Actually, not much control is necessary with a unit that has been in operation for some time and is operated by experienced men. The digestion process is not one which is easily upset by ordinary variations that will occur during normal operations. Usually the alkalinity and the volatile content of the digested sludge are considered the best indicators as to how the process is functioning. It has never been necessary to use lime to produce the alkaline condition that is essential to normal operations, as the catabolism of the fresh solids has always provided sufficient ammonium alkalinity. On a number of occasions when digesters have been pumped down and cleaned out, it has been possible to put them back into operation by filling them with supernatant liquor, and then charging lightly for a few days.

The digester contents are heated to between 85 and 95 degrees F., the former figure being achieved during the winter and the latter during the summer months. Generally speaking, although there are six gas-fired hot water heaters available for heating the digesters, it is necessary to use only three of them. On the average, 18 per cent of the gas produced is required for heating the digesters.

For a while, it was customary to make monthly inventories of the contents of all of the sludge digesters as a routine control measure. After some time, however, it was felt that the required work in connection with this procedure as a routine matter did not justify its continuance, and it is only upon special occasions that digester inventorying is now done. The difficulties encountered, especially in measurement and sampling of the scum layer, were such that not very great reliance could be placed on the results. The information collected during this inventorying period, however, has proved to be very valuable in picturing the general physical state of the digesters, and has been useful in other ways.

Operation and Maintenance Difficulties

The difficulties encountered in the operation and maintenance of the digesters have been relatively few in number and none of them serious in nature. The more troublesome problems are as follows:

1. *Gas Handling Capacity.*

Because of the fact that the digesters are operated at much higher loads during the summer months than was anticipated, the size of the gas piping at such times has been insufficient for the amount of gas being produced, and wasting it has been a difficut problem. In the control chamber servicing the four newer digesters, minor changes in the piping layout along with provision for wasting gas from the pressure header to a waste burner have alleviated conditions considerably. In the control chamber servicing the older two digesters, a complete change of the gas piping along with the installation of newer (improved) flame traps has produced very satisfactory operating results.

2. *Condensate in Gas Lines.*

Considerable gas piping servicing the various buildings is buried in the ground. Due to settling of the filled ground and for other reasons, we have been troubled with pockets of condensate forming at the low points which produce surging and other difficulties. This has necessitated digging up portions of the gas lines and regrading.

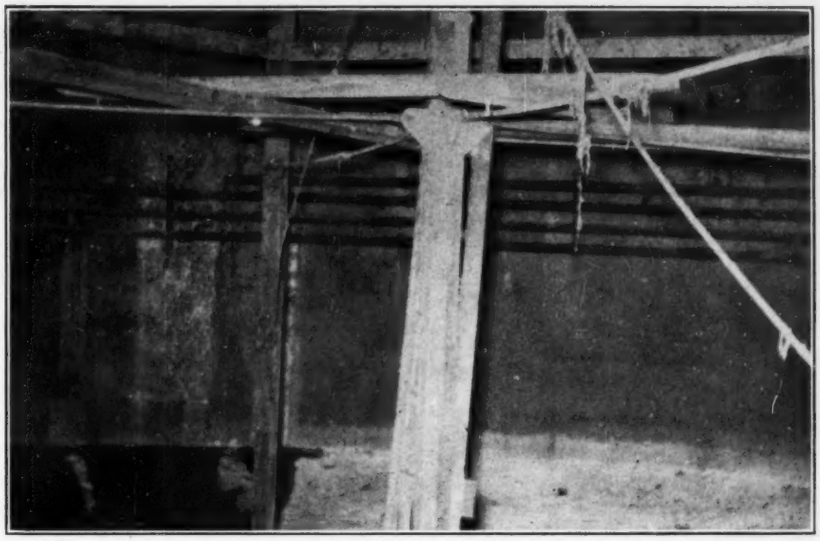
3. *Scum Formation*

The excessively thick scum formations in the digesters have been the scource of considerable trouble and annoyance. Up to 1938, the rate of charging of the digesters was such that the scum formations would increase in depth until a maximum depth would be established at which portions of the scum layer would drop to the bottom of the digesters about as fast as it formed, thus maintaining more or less an equilibrium as to the thickness of the scum layer. During the last few years, however, the rate of charging has been increased considerably, and the scum formations have increased in depth and quite regularly the hot water heating coils have been broken by the movement of the scum mass. This necessitated taking the digester out of service, pumping it down, cleaning it out, repairing the broken heating pipe coils and sludge inlet piping support, and then putting it back into service. This happened a number of times before a permanent remedy was found which has been successful in preventing

additional breaks in the coils. However, a new trouble has arisen from this condition to plague us, which consists of the scum layer increasing in depth until it enmeshes the hot water pipe coil, and acts as an insulator preventing heat from reaching the sludge. This excessively thick scum layer also prevents drawing off supernatant liquor even from the lowest takeoffs, and seriously affects the normal operation of the tank. Circulation of the contents of the digesters has been of no appreciable benefit and our only recourse at the present time is to pump the tank down and clean it out.

4. *Ordinary Maintenance.*

Very little trouble has been experienced with the maintenance of the centrifugal sludge pumps, gas-pressure booster pumps, hot water-heaters and controls, hot water circulating pumps, flame traps, waste gas burners, and recording hot water thermometers. Corrosion of the steel work in contact with the sludge has been very minor in nature.



Interior of No. 5 Digester
(Showing repairs under way to heating coils broken by scum mass)

Gas Utilization

Digester gas is used for heating all of the six plant structures and buildings and no coal has been necessary for this purpose for the last six years. Gas is also used in the laboratory, sludge incinerators, machine shop forging furnace, liquid chlorine gas-heated evaporator, as well as for firing the hot water heaters which supply hot water to the digesters.

No utilization of gas in gas engines has been made yet at the Westerly Plant because there is insufficient gas for the engine capacity that would be necessary to justify the labor operating charges that would ensue.

Summary

The heated separate sludge digestion units at the Westerly Plant serves to reduce the total dry solids in the raw sludge by one-third, and in so doing, reduces the volatile content of the sludge by one-half. A stabilized, well-digested sludge is produced which has lost all of its original and objectionable character. There is little repugnance on the part of the men in handling digested sludge in the later processing operations. The digesters and the sludge storage tank can be utilized very easily as sludge holding tanks at times when maintenance work is necessary in the filtration-incineration unit. There is no odor nuisance in storing the sludge in open tanks, and only a faint ammoniacal odor is present when the conditioned sludge is vacuum filtered.

The digestion process, even though it has reduced the volatile content of the raw sludge by 50 per cent, has still not reduced the combustible content of the digested sludge to a point where an appreciable amount of gas has to be returned to the incinerators in order to properly burn the filter cake. During the year 1941, it was necessary to burn 293 cubic feet of gas per ton of filter cake incinerated. This amounts to approximately only 4 per cent of the total gas produced. The fact that the filter cake has almost self-sustaining burning properties serves to produce comparatively low temperatures in the incinerators even with heavy loads.

The digester gas produced is a valuable byproduct and has eliminated the use of coal, and has reduced the use of fuel oil to very small amounts. Difficulties that once were experienced in firing heating boilers with coal, and removal of ashes, have been entirely eliminated. Gas burners with complete automatic control have given more uniform steam pressures and building temperatures. A total of twenty-two million cubic feet of gas were used during 1941 for heating the buildings and the incinerators.

A cost study during 1939 revealed that total operating and maintenance costs of the digestion tanks were $1.61 per m.g. of sewage treated, and that if all of the gas produced in excess of that necessary to heat the digesters had been sold for $.33 a thousand cubic feet, the digestion unit would be self-sustaining financially.

The operating difficulties and maintenance work necessary have been minor in character, and the reduction accomplished and gas produced are well worth the processing effort.

Buffalo Raises Water Rates (First Increase in 22 Years)

The metered water rates established in September, 1920, have repeatedly been up for revision but each time laid on the table by the City Council.

Just recently N. L. Nussbaumer, Commissioner of Works and Alan Drake, Director of Water, went before the present Buffalo Council and obtained an upward revision in rates. The new rates effective since September 1st are:

Monthly charges per 100 cu. ft.

1st 3,000 cu. ft.	11c
3,000 to 6,000 cu. ft.	7.7c
Above 6,000 cu. ft.	4.4c

Asylums, churches, public hospitals, charitable institutions, schools (public, private and parochial), and colleges shall only pay at the rate of three and three-tenths cents per hundred cubic feet for all water used, whatever the quantity.

The latter is a carryover from the 1920 ordinance which allowed the special rate which was until now at the rate of 3c per 100 cu. ft. regardless of total use.

The rate increases throughout represent a 10% addition to the rates established in 1920.

The Present Status of Biofiltration

The Author

By A. J. Fischer, Ph.D.
Development Department
THE DORR COMPANY, INC.
NEW YORK

THE increase in popularity of "Biofiltration" as a secondary treatment process for domestic and industrial sewages is attested by the fact that at the present time (July 1, 1942) there are 150 such plants now in operation or under construction in the United States. These are distributed among 36 of the states. Ninety-three of these plants (62 per cent of the total) are in army and navy camps and bases, airports and ordnance works. Plant design populations range from 200 to 65,000.

There are 86 single stage plants as against 64 multi-stage, only two of the latter employing more than two-stage treatment. In both types of plants a wide variety of flow sheets is possible. Those that have been used most frequently are shown in Figures 1 and 2.

Each of these flow sheets has its advantages. Choice depends chiefly on local considerations, such as the topography of the plant site and preference of the designing engineer as to arrangement of units, piping, layout, etc.

A considerable amount of reliable data has become available from plants using flow sheets 1a, 2a and 2b. These flow sheets, now considered as preferable layouts, have consistently given good results.

The double recirculation scheme in the *single stage* plant, as illustrated in flow sheet 1a, represents a combination of the Jenks system (return of filter discharge to the raw sewage) with the Ward Process (return of final effluent to the filter). These are covered by U. S. Patents 2,168,-208 and 2,258,398. This combination scheme permits the use of a primary and secondary clarifier of like size. In a sense it is quite similar to the two-stage flow sheet 2a, with both filters merged into a single unit.

Alternate methods of applying this flow sheet are: (1) The return of a large volume of filter effluent

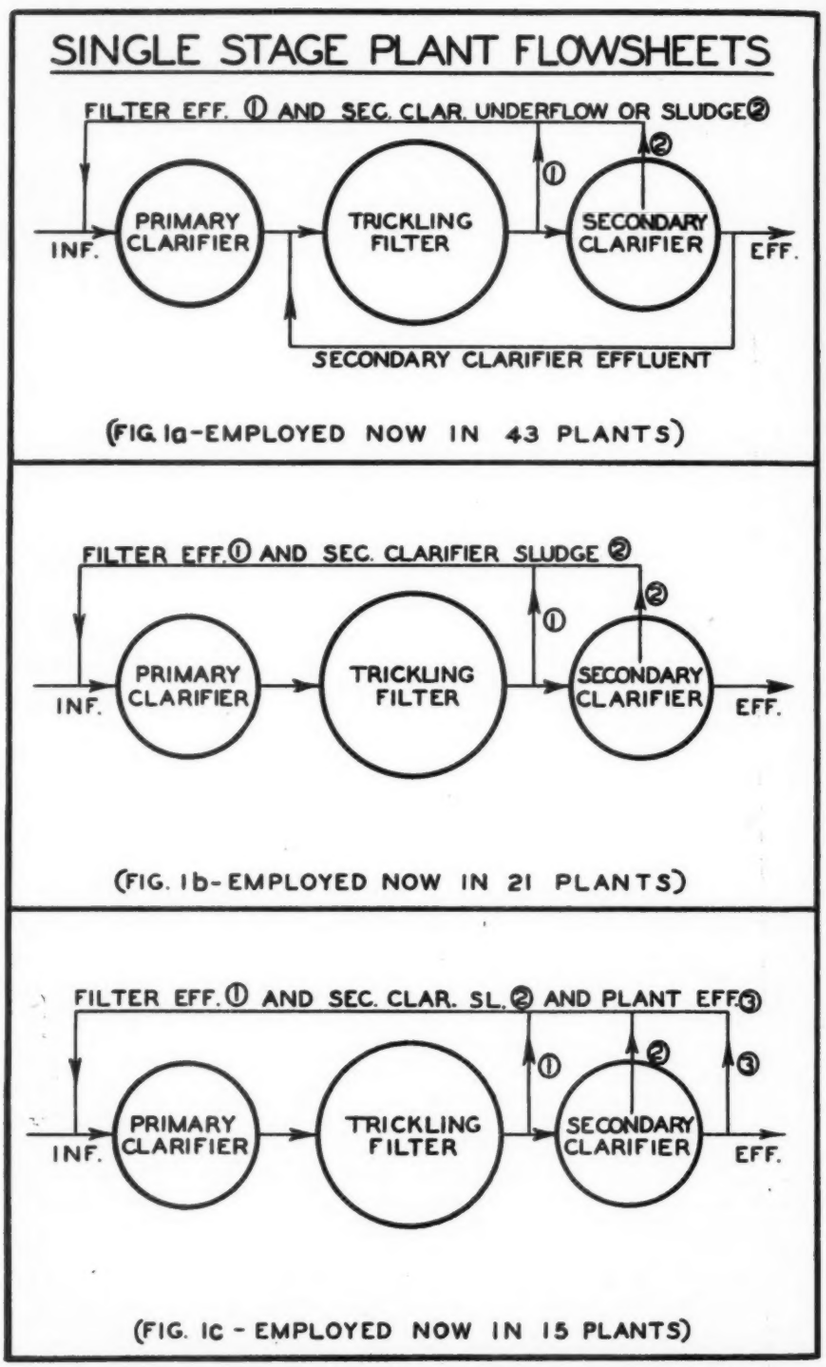


Fig. 1 (a-b-c)—Flow Sheets Employed in Single-Stage Biofilter Plants

and and a relatively small volume of thick secondary sludge to the raw sewage, or (2) The return of large volumes of dilute sludge laden secondary underflow.

The latter appears to be preferred for small plants, where it is desired to reduce the number of pumps required to a minimum. Based on hypothetical considerations, however, the former is preferable from the standpoint of obtaining better secondary clarification, as the inflow rate to the secondary clarifier is greatly decreased although the overflow rate remains about the same.

Recirculation of filter effluent directly back to the filter has been tried and abandoned at some plants in favor of flow sheets 1a because of odor nuisance and poor clarification. Apparently the continuous recirculation of the solids laden filter discharge back to the filter, without some form of intermediate settling, promoted digestion of the solids in the filter bed and encouraged anaerobic conditions.

To preclude the overloading of the filter with solids, both the two-stage flow sheets, 2a and 2b, utilize the ample primary clarifier for the dual purpose of settling both the raw sewage and the primary filter effluent. Flow sheet 2a has the advantage that all of the material passing to the secondary circuit must pass through the primary filter at least once. In flow sheets 2b less pumping is required where the filters are both located at the same elevation.

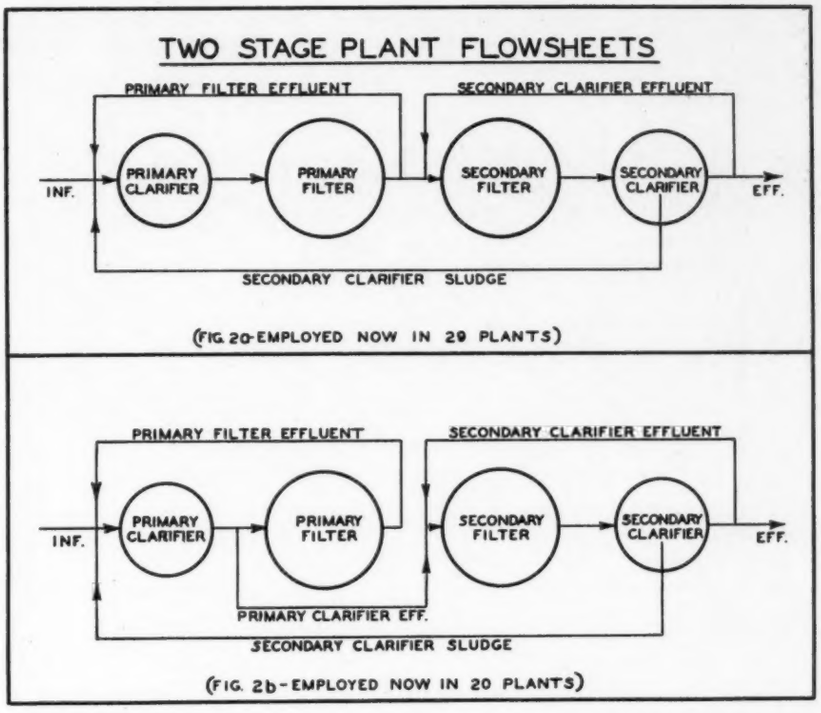


Fig. 2 (a-b)—Flow Sheets Employed in Two-Stage Biofilter Plants

Design Factors

Data obtained at the early Biofilter plants, chiefly at Petaluma and Healdsburg, Calif., indicated that certain design factors might be assumed. These were covered in some detail in an article by the writer that appeared in the October, 1940, issue of *"Water Works and Sewerage."*

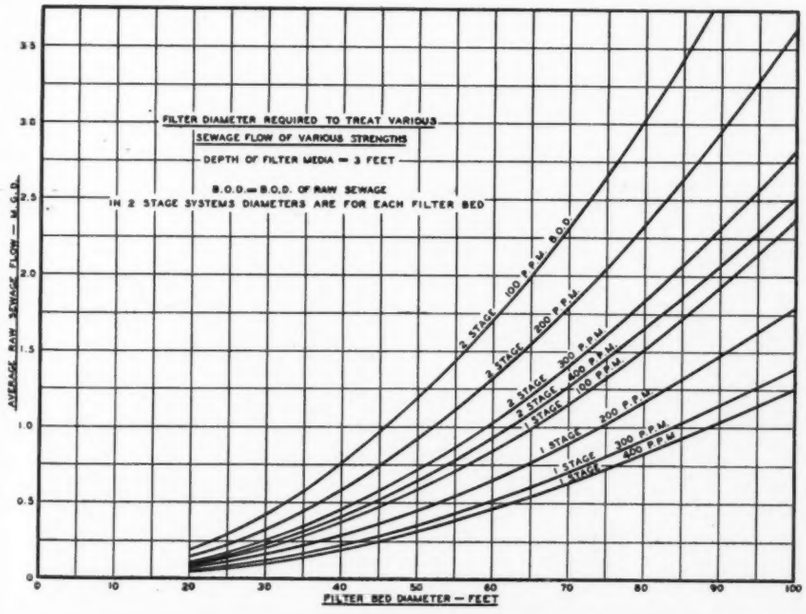

FILTER DIAMETER REQUIRED TO TREAT VARIOUS SEWAGE FLOW OF VARIOUS STRENGTHS
DEPTH OF FILTER MEDIA = 3 FEET
B.O.D. = B.O.D. OF RAW SEWAGE
IN 2 STAGE SYSTEMS DIAMETERS ARE FOR EACH FILTER BED
2 STAGE 100 P.P.M. B.O.D.
2 STAGE 200 P.P.M.
2 STAGE 300 P.P.M.
2 STAGE 400 P.P.M.
1 STAGE 100 P.P.M.
1 STAGE 200 P.P.M.
1 STAGE 300 P.P.M.
1 STAGE 400 P.P.M.
AVERAGE RAW SEWAGE FLOW — M.G.D.
FILTER BED DIAMETER — FEET

Fig. 3—Diameters of Filters with 3 ft. Bed Depth Required for Various Volume and Strength Loadings.

1. Filter Loading

More recent data, especially those collected at certain army camps where the plants are operated at or above rated capacity, indicate that the filter loadings recommended in the past are conservative and may still be followed. Figure 3 shows the size filter required for the treatment of various flows and strengths of sewage. These sizes are based on the assumption that the overall B.O.D. reduction is 85 per cent, with 30 per cent being removed in the primary clarifiers. B.O.D. removals in the filter and secondary clarifiers were assumed as follows:

Raw Sewage B.O.D. (p.p.m.)	B.O.D. Removed by Filter and Secondary Clarifier (Lbs./ cu. yd./day)
100	1.25
200	1.92
300	2.25
400	2.70

2. Filter Depth

Filter depth should unquestionably be considered in evaluating the loading figures. This is covered in the group of curves presented in Figure 4.

In neither Eldridge's or Keefer's tests, shown in this figure, was recir-

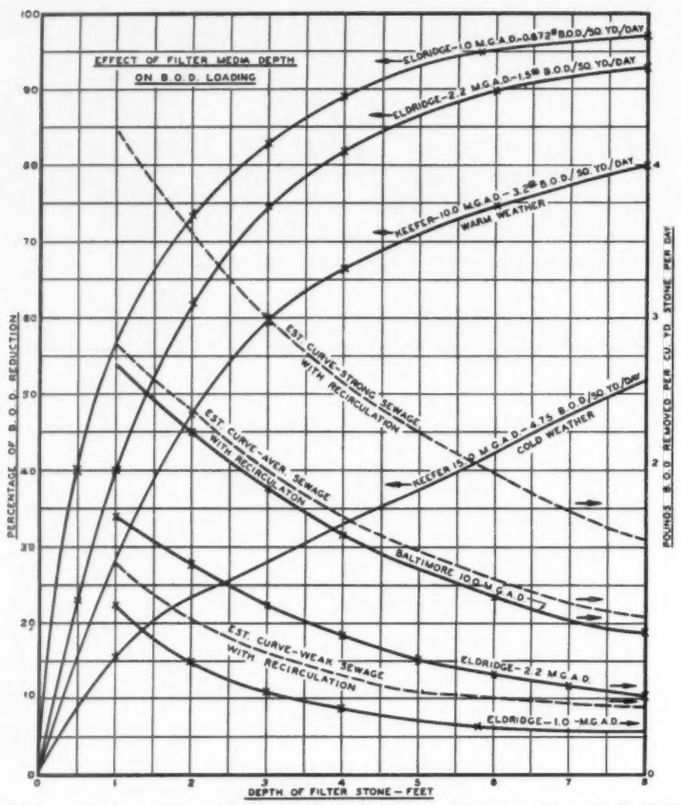

EFFECT OF FILTER MEDIA DEPTH ON B.O.D. LOADING
ELDRIDGE-1.0 M.G.A.D.-0.872 B.O.D./SQ. YD./DAY
ELDRIDGE-2.2 M.G.A.D.-1.58 B.O.D./SQ. YD./DAY
KEEFER-10.0 M.G.A.D.-3.28 B.O.D./SQ. YD./DAY WARM WEATHER
EST. CURVE-STRONG SEWAGE WITH RECIRCULATION
KEEFER-15.0 M.G.A.D.-4.75 B.O.D./SQ. YD./DAY COLD WEATHER
EST. CURVE-AVER. SEWAGE WITH RECIRCULATION
BALTIMORE-10.0 M.G.A.D.
EST. CURVE-WEAK SEWAGE WITH RECIRCULATION
ELDRIDGE-2.2 M.G.A.D.
ELDRIDGE-1.0 M.G.A.D.
PERCENTAGE OF B.O.D. REDUCTION
POUNDS B.O.D. REMOVED PER CU. YD. STONE PER DAY
DEPTH OF FILTER STONE - FEET

Fig. 4—Filter Performance Curves, Revealing the Relationship of Bed Depths to Work Accomplished at Various Loadings

culation employed. Because of temperature differences, Keefer's results at 15.0 m.g.a.d. do not follow exactly the trend obtained at the lower dosing rates.

Also shown in this figure are estimated B.O.D. removal curves *with* recirculation. These curves are based on test data obtained from a representative number of Biofilter plants. From these curves, B.O.D. removals recommended as a basis of design for various filter depths under favorable temperature conditions are given in Table 1. For ease in computing these filter sizes and as an added factor of safety, the figures given may be taken as the applied load to the filter rather than the actual removal in the bed.

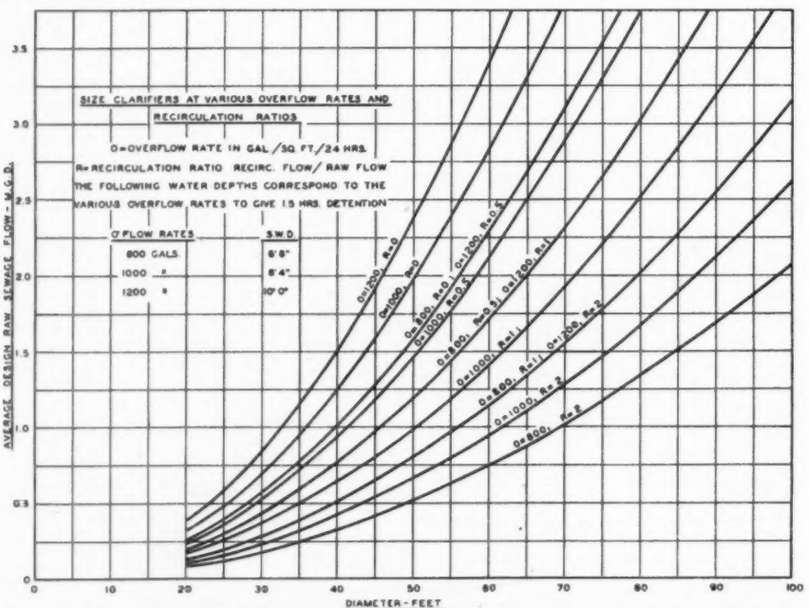

SIZE CLARIFIERS AT VARIOUS OVERFLOW RATES AND RECIRCULATION RATIOS
O=OVERFLOW RATE IN GAL./SQ. FT./24 HRS.
R=RECIRCULATION RATIO RECIRC. FLOW/RAW FLOW
THE FOLLOWING WATER DEPTHS CORRESPOND TO THE VARIOUS OVERFLOW RATES TO GIVE 1.5 HRS. DETENTION
O'FLOW RATES
800 GALS.
1000 "
1200 "
S.W.D.
6'8"
8'4"
10'0"
AVERAGE DESIGN RAW SEWAGE FLOW - M.G.D.
DIAMETER - FEET

Fig. 5—Diameters of Clarifiers for Three Overflow Rates at Various Recirculation Ratios.

TABLE 1

Lbs. B.O.D./cu. yd./day Removed in Filter at Various Depths of Media

Depth of Stone, ft.	Weak Sewage Less than 100 p.p.m.	Average Sewage 200-300 p.p.m.	Strong Sewage 500-700 p.p.m.
3	0.80	2.0	3.0
4	0.67	1.70	2.58
5	0.57	1.48	2.25
6	0.50	1.31	1.98
7	0.47	1.16	1.75
8	0.45	1.05	1.53

An additional 30 per cent removal in B.O.D. in the primary clarifier should be assumed for ordinary domestic sewage. For exmaple, with average sewage and a 3 ft. stone depth, the safe filter loading based on raw sewage may be taken as

$$\frac{2.0}{0.7} = 2.86$$

lbs. per cu. yd. per day, rather than the 2 lbs. listed in Table 1.

It is of interest to note that 122 of the Biofilter plants in operation or under construction have filter bed depths of only 3 ft. In only 14 plants are the depths greater than 4 ft.

3. Clarifier Overflow Rates

Clarifier overflow rates may well be lowered to about 800 to 1,000 gals./sq. ft./24 hrs. for all types of plants and for both primary and secondary units. Corresponding detention periods should be 1.5 to 2.0 hrs.

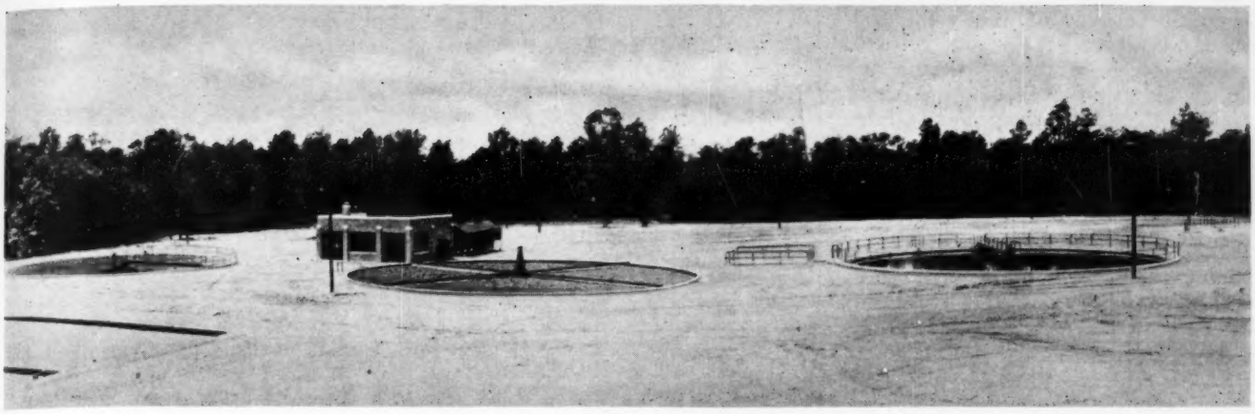
At a number of plants an auxiliary launder located around the clarifier center-feedwell, is used for taking off the flow that is recirculated. In these instances, all of the effluent that overflows the peripheral weir is discharged from the plant. This use of a separate recirculating flow launder results in lower peripheral tank overflow rates and gives a clearer final effluent.

Improved clarification may also be obtained by using lower recirculation rates under some conditions, especially in the second stage of two-stage plants.

Suggested clarifier sizes at various flows, overflow rates and recirculation ratios, are shown in Figure 5. Units ranging in size from 12 ft. diameter to 100 ft. diameter are in use.

4. Two-Stage Design

Unless the raw sewage or other waste being treated is very strong, it appears questionable whether two stage treatment will show any marked advantages over single stage treatment using flowsheet 1a assuming the same total filter area used in both cases, unless a finer filter media is used in the secondary bed of the two-stage system. A more rational



U. S. Army Camp Plant Using Flow Sheet 1a

two-stage design appears to call for the use of a greater volume of filter media in the primary than in the secondary bed.

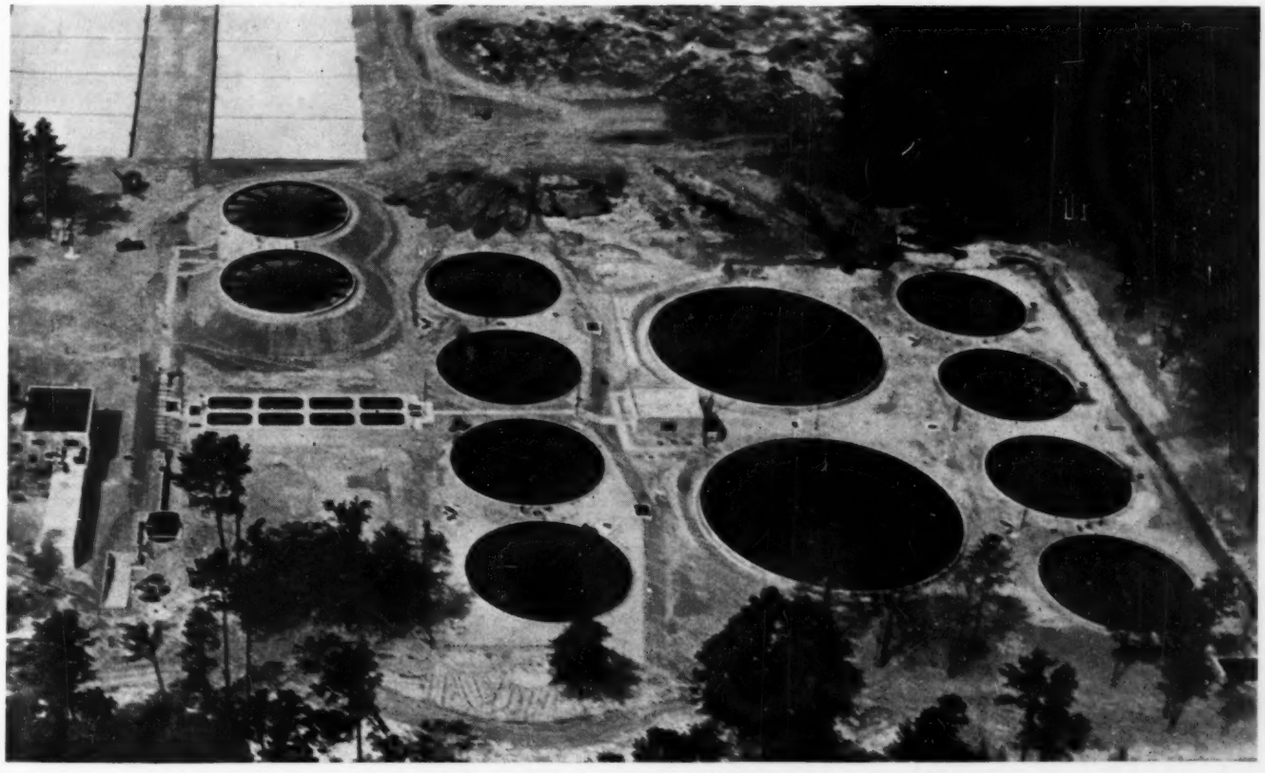
5. Filter Bed Design

Psychoda flies are non-existent at many Biofiltration plants. At others they are present but not nearly in such quantities as exist at other types of trickling filter plants. In order to play safe, however, the filters may be constructed so that they can be flooded in case the presence of even a small number of flies can not be tolerated. Also, circular beds are preferred so that undosed corners such as occur in square and octagonal beds are avoided. Such undosed corners are excellent places for fly breeding. Shallow construction and provision for adequate ventilation and drainage are emphasized characteristics in the design of "Biofilters."

If it is not desired to install ventilation tiles, suitable air ducts may be built in the filter walls at desired intervals, using Z-shaped forms built of light sheet metal. The bottom legs of these forms should extend through the wall inside the tank at points just below the underdrains. The top legs should extend to the outer edge at a point above the stone surface. The use of the light sheet metal forms avoids undesirable restriction of the openings. In time they rust out, leaving a clean duct in the concrete. Ventilation ducts of this type are clearly shown around the periphery of the filter in the photo of the Stockton State Home, Calif. Biofilter plant.

6. Preferred Layout

Flow sheets that are preferred and which lend themselves to simple layouts with maximum flexibility and a minimum of piping are shown in Figures 6, 7 and 8. Figure 6 shows a single-stage plant layout using double recirculation (flow sheet 1a) This layout shows a system wherein the sewage is pumped to the primary clarifier and, therefrom, flows



U. S. Army Camp Plant Using Flow Sheet 1c

through the rest of the plant by gravity. Where it is necessary or desirable to locate the filter at a higher elevation than the primary clarifier, the sewage may flow to the clarifiers by gravity and the settled sewage be pumped to the filter.

Figure 7 shows a two-stage layout corresponding to flow sheet 2a. Here, as in Figure 6, the main flow lines are shown solid, and the dotted lines indicate piping which may be added to secure greater plant flexibility.

Figure 8 shows a layout of a two-stage gravity flow plant wherein a *single* pump is used for recirculation duty in both the primary and secondary systems; and too, a minimum of piping is required. With this scheme the flow from the pump sump has to be divided by means of control valves or a splitter box.

7. Recirculating Pumps

The design of pump recommended for recirculation is known as the propeller type, such as has been used extensively in irrigation work. This type of pump has relatively high efficiencies at low heads and is made in sizes ranging from 8 in. to 36 in., having normal capacities of 450 to 40,000 g.p.m. at about 10 ft. head. Where smaller pumping capacities are required, any of the standard open impeller centrifugal pumps should be applicable. Normally with a 3 ft. filter media depth, the recirculation unit will be pumping against about a 10 ft. total dynamic head.

Recirculating pump suctions should be connected with sumps or wet wells of adequate size regardless of the type of pump employed. Minimum sump dimensions are those suggested in Table 2.

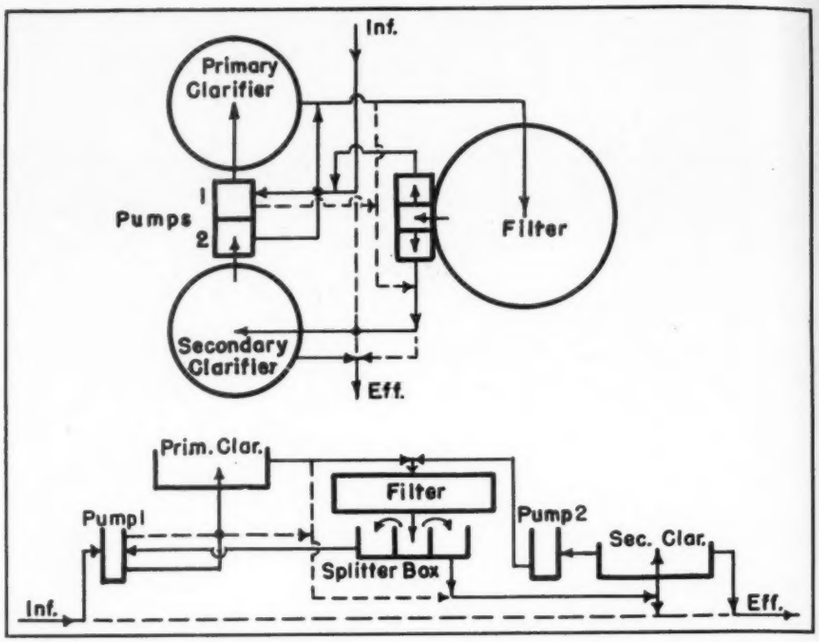


Fig. 6—Layout of Single Stage Plant Employing Double Recirculation—Covered in Flow Sheet 1a

TABLE 2

Minimum Pump Sump Dimensions

Pump Capacity at 10 ft. Head—	Total WxL, ft.	Depth, ft.
Up to 500 g.p.m.....	4x 4	6
500 g.p.m. to 1,000 g.p.m.	5x 5	7
1,000 g.p.m. to 3,000 g.p.m.	6x 6	8
3,000 g.p.m. to 6,000 g.p.m.	8x 8	10
6,000 g.p.m. to 9,000 g.pm.	10x10	12

Customarily one constant speed pump is used for each recirculating system with a variable speed unit, having a 2:1 speed variation, as the spare unit. In two-stage systems the spare pump should be so connected that it may be used in either the primary or the secondary circuit.

8. Distributor Design

In order to handle the very high rates of application used in Biofilter plants (up to 102 m.g.a.d.), special designs of revolving distributors had to be developed. Four types of units are in use, depending on whether two or four arms are used, and whether the arms are of the single or double

U. S. Army Camp Plant Using Flow Sheet 2b

compartment type. The number of each type in use is as follows:

2 arm—single compartment — 45 in 37 plants

2 arm—double compartment — 94 in 56 plants

4 arm—single compartment — 79 in 48 plants

4 arm—double compartment — 15 in 9 plants.

Choice of design depends chiefly on the total dosing rate and the flow variation that has to be handled by the distributor. Frequency (constancy) of dosing, as determined by the time interval of passage of an arm past a given point, apparently has little or no effect on plant efficiency. A typical comparison made at Healdsburg, Calif., with two arm distributors operating at various speeds of travel, is shown in Table 3. In each case the average speed of the distributors was close to the figures shown as maximum speeds.

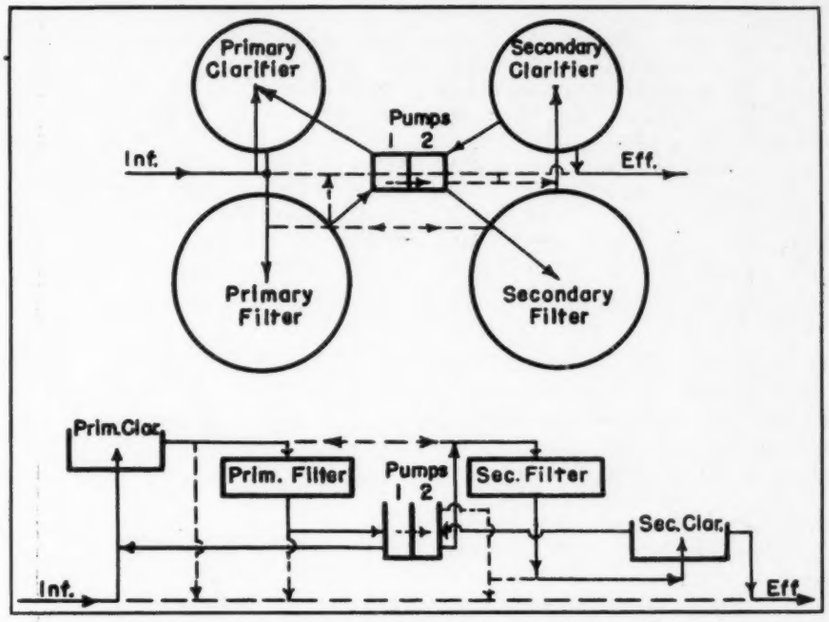


Fig. 7—Layout of Two Stage Plant—Covered in Flow Sheet 2a

TABLE 3

Comparison of Results at Different Distributor Speeds of Rotation

	5 *Day Test*	3 *Day Test*
	Distributor Speeds—r.p.m.	
	1.5 (Min.) 3.0 (Max.)	3.6 (Min.) 6.0 (Max.)
Aver. flow (m.g.d.)	0.177	0.182
Suspended Solids (p.p.m.)		
Raw	200	209
Final effl.	27	28
% removal	86.5	86.5
B.O.D. (p.p.m.)		
Raw	304	300
Final effl.	25	25
% reduction	91.8	91.8
Recirculation ratio	5.10	4.93
Lbs. B.O.D./cu. yd./day		
Raw	1.99	2.00
Removed	1.83	1.83
Clarifier Overflow Rate (gal./sq. ft./24 hrs.)		
Primary	1,770	1,770
Secondary	1,530	1,530

In general, two arm distributors for Biofilter plants are designed to rotate at speeds not exceeding 3 r.p.m., while four arm units are designed to operate at speeds not exceeding 1.5 r.p.m.

Distributors in present use range from 12 to 160 ft. in diameter.

Operating Data

Data collected over an eight months' period at a typical army camp are shown in Table 4. These are the first long time records available on a Biofiltration plant operated at 92.2 per cent of design capacity, based on B.O.D. loading. The ratio of actual to design flow is 0.87. Here the two-stage process is used and the recirculation ratio in the secondary stage was very low. These results and all others given in this paper are on 24 hour composite samples.

Data from another army camp using the single stage process are given in Table 5. Here the plant was operating at an average of 110% of rated capacity based on B.O.D. loading, and 67% of capacity based on flow. The excellent results obtained were undoubtedly greatly aided by the long clarifier detentions and low overflow rates.

Records from four other two-stage army camp plants are shown in Table 6. These figures are of interest in that they show that an important characteristic of a Biofilter is that its capacity for removing B.O.D. increases with the applied load. This tendency had been noted previously in studies made at Petaluma, Calif., and elsewhere, and also in high loading industrial waste treatment studies. It will also be noted that except in one case the ratio of actual to design B.O.D. loading is greater than the ratio of actual to design flow loading. The design B.O.D. loading is based on 1.85 lbs. of B.O.D./cu. yd./day applied to the filter, with a 40% B.O.D. reduction in the primary clarrifier as set up in army camp standards. This gives a plant loading of 3.1 lbs. B.O.D./cu. yd./day, based on the raw sewage B.O.D.

In considering B.O.D. per cu. yd. removal figures in Biofilter plants, it must be borne in mind that they include the removals that occur in the clarifiers as well as in the filters

TABLE 4

Two-Stage Army Camp Plant Using Flow Sheet 2a

	Clarifier Detention Hrs.		Clarifier Overflow Rate Gal./sq.ft./24 hr.		Recirculation Ratio		Susp. Sol. p.p.m.		B.O.D. p.p.m.		B.O.D. Lbs./cu. yd.		% Removal Susp.	
Month	Pri.	Sec.	Pri.	Sec.	Pri.	Sec.	Raw	Final	Raw	Final	Raw	Removed	Sol.	B.O.D.
1	3.26	2.02	552	890	0.67	0.33	281	22	262	44	3.48	2.90	92.2	83.2
2	2.56	1.96	705	923	1.22	0.45	224	25	226	40	2.89	2.57	90.0	82.3
3	2.86	2.34	631	770	1.40	0.46	226	19	220	20	2.41	2.05	91.6	91.0
4	3.22	2.55	561	708	1.54	0.60	154	25	144	7	1.28	1.09	84.2	95.1
5	2.12	1.67	850	1080	1.20	0.39	217	24	193	26	2.99	2.55	89.0	86.5
6	2.06	1.79	878	1010	1.54	0.47	223	23	192	19	2.66	2.26	89.7	90.0
7	2.12	1.74	850	1040	1.34	0.45	209	26	218	28	3.05	2.50	88.4	87.2
8	2.28	1.97	790	915	1.28	0.32	223	31	223	34	3.10	2.64	90.2	84.8
Average	2.56	2.00	727	917	1.26	0.44	221	24	209	27	2.86	2.51	89.1	87.0

TABLE 5

Single Stage Army Camp Plant Using Flow Sheet 1a

Month	Clarifier Detention Hrs.		Clarifier Overflow Rate Gal./sq.ft./24 hr.		Recirculation Ratio		Susp. Sol. p.p.m.		B.O.D. p.p.m.		B.O.D. Lbs./cu. yd.		% Removal Susp.	
	Pri.	Sec.	Pri.	Sec.	Pri.	Sec.	Raw	Final	Raw	Final	Raw	Removed	Sol.	B.O.D.
1 ...	4.32	4.32	438	438	1.04	1.04	339	5	185	11	2.04	1.92	98.5	94.0
2 ...	3.71	4.08	510	463	1.17	0.96	177	18	450	5	4.96	4.91	89.8	99.0
3 ...	3.71	4.56	510	415	1.25	0.82	200	4	185	12	2.04	1.91	98.0	93.4
4 ...	3.86	4.68	490	405	1.28	0.89	271	9	391	9	4.31	4.20	96.7	97.7
5 ...	3.26	3.50	580	540	0.70	0.58	293	31	340	54	3.75	3.16	89.4	84.2
Average	3.78	4.23	506	452	1.09	0.86	256	13	310	18	3.42	3.22	94.8	94.2

on each stage. In flow sheets 2a and 2b it is easy to determine the removals that take place in both the primary and secondary circuits if analyses of the effluent from each are available. Such is not the case, however, with the individual clarifier units because of the flow recirculated in each circuit. Knowing the recirculated flows and the effluent analyses from all the units, however, the pounds of B.O.D. actually removed in each unit may be rearily computed.

Table 7 reveals interesting data obtained at six two-stage plants. These figures show that in all cases except the second test at Petaluma, where half the filter beds were taken out of service in order to increase the fiiter loading, the greater part of the B.O.D. reduction took place in the first stage of treatment.

An analysis of the removals in the individual units further shows that negative removals or very low re-

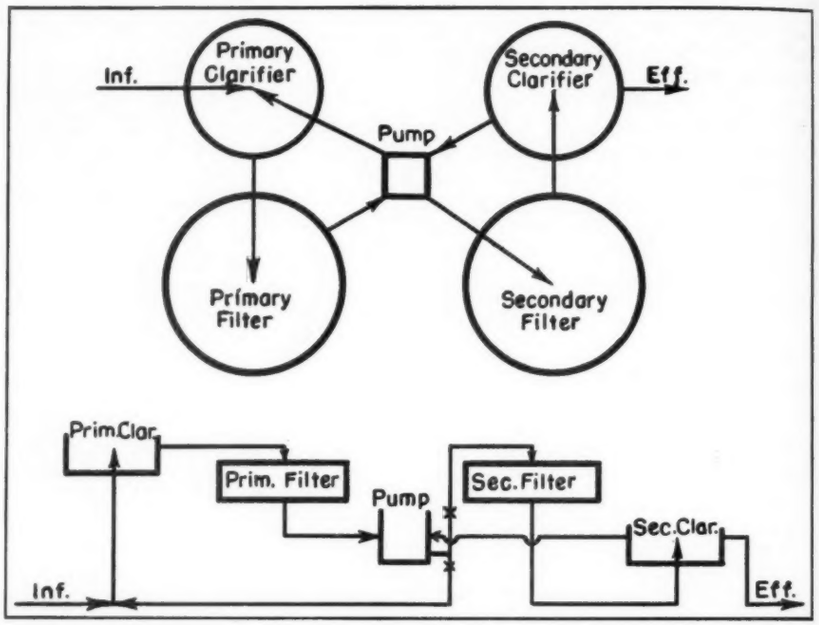
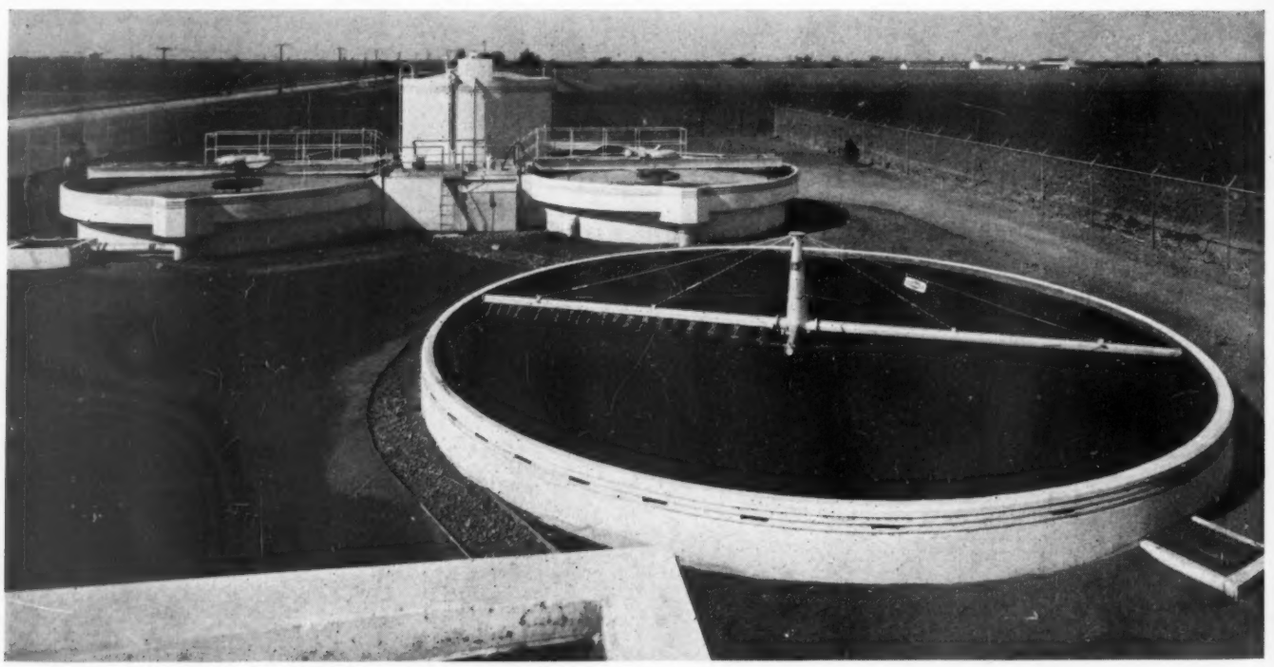


Fig. 8—Simplified and Economical Layout of Two-Stage Plant in Which One Recirculation Pump Performs Double Duty



Stockton State Home Plant (California) Employing the Combination Recirculation of Flow Sheet 1a
(Note the vents around the lip of the filter. These vents are inexpensively built into the filter wall using thin sheet metal forms.)

TABLE 6

Army Camp Plant Results

	No. 1 Plant	No. 2 Plant	No. 3 Plant	No. 4 Plant
Flow sheet	2a	2a	2b	2b
Test period	4 Mos.	3 Mos.	18 Days	1 Mo.
Per cent of Design Capacity Based on:				
Average flow	79	108	64	72
B.O.D. loading	102	123	69	46
Recirc. Ratio:				
Primary	0.87	1.30	2.31	1.38
Secondary	1.57	1.14	2.86	1.38
Suspended Solids:				
Raw	250	187	279	63
Final	31	38	19	6
Per cent removal	91.6	79.5	93.2	90.5
B.O.D.—Raw	212	281	327	111
Final	24	70	31	17
Per cent removal	88.8	75.0	90.5	84.7
B.O.D.—Lbs./cu. yd.				
Raw	3.15	3.82	2.15	1.43
Removed	2.80	2.86	1.95	1.21

TABLE 7

Detailed Biofilter Data Showing Removals in Individual Plant Units

Plant	Army Camp Plant No. 1	Army Camp Plant No. 2	Army Camp Plant No. 3	Liberty, N. Y.	Healdsburg, Calif.	Petaluma, Calif.	
Flow Sheet	*2a*	*2a*	*2a*	*2a*	*Special*	*2b*	*2b*
Clarif. Overflow Rate—(Gal./sq.ft./24 hr.)							
Primary	906	1200	747	1426	1770	878	878
Secondary	1010	836	617	1140	1530	623	623
Clarif. Detention (Hrs.)—							
Primary	2.00	1.40	2.60	1.14	0.92	1.84	1.84
Secondary	1.79	2.01	3.03	1.42	1.06	2.60	2.60
Recirculation Ratio—							
Primary	1.33	0.53	1.12	2.56	6.20	2.45	2.45
Secondary	0.32	0.07	1.12	2.92	5.23	1.45	1.45
Susp. Solids—							
Raw Sewage	232	228	196	160	249	424	462
Pri. Clar. Effl.	57	76	73	74	64	124	150
Pri. Filt. Effl.	51	45	64	69	115	104	146
Sec. Filt. Effl.	62	32	48	65	43	81	76
Sec. Clar. Effl.	24	17	26	26	29	33	43
B.O.D.—							
Raw Sewage	255	149	240	202	395	576	521
Pri. Clar. Effl.	135	127	163	70	84	227	333
Pri. Filt. Effl.	105	33	102	43	115	114	283
Sec. Filt. Effl.	68	23	82	35	37	23	38
Sec. Clar. Effl.	37	12	44	22	27	14	28
% Removal of B.O.D.—							
Pri. Stage	58.9	77.9	57.5	78.8	70.8	60.5	36.0
Sec. Stage	26.6	14.1	24.0	10.2	22.3	37.0	58.5
Total	85.5	92.0	81.5	89.0	93.1	97.5	94.5
Lbs. B.O.D./cu.yd. Applied—							
Pri. Stage	5.87	4.66	6.65	2.72	5.08	4.90	10.6
Sec. Stage	4.82	1.03	2.83	0.58	1.08	1.92	6.45
Total	3.91	2.33	3.32	1.36	2.54	2.45	5.3
Lbs. B.O.D./cu.yd. Removed—							
Pri. Stage	3.46	3.64	3.82	2.15	4.00	2.96	3.83
Sec. Stage	3.12	0.66	1.61	0.28	0.69	1.80	5.81
Total	3.35	2.15	2.71	1.21	3.72	2.39	5.01
Total Lbs. B.O.D.—							
In Raw Sewage	4600	1094	2760	1515	573	2400	2170
In Final Effl.	662	88	506	165	39	58	117
Lbs. B.O.D. Removed—							
In Pri. Clar.	1450	—450	97	473	730	303	270
In Pri. Filt.	1260	1305	1490	719	—323	1157	510
In Sec. Filt.	486	—24	—259	—128	—77	789	1169
In Sec. Clar.	738	178	926	286	205	91	102
% Removal of B.O.D.—							
By Pri. Clar.	31.5	—41.2	3.5	31.2	127.2	12.6	12.4
By Pri. Filt.	27.4	119.1	54.0	47.5	—56.3	48.1	23.5
By Sec. Filt.	10.6	—2.2	—9.8	—8.5	—13.4	32.9	53.8
By Sec. Clar.	16.0	16.3	33.8	18.9	35.8	3.9	4.7
Lbs. B.O.D. Removed—							
Per K.W.H.	14.5	6.35	10.5	6.70	4.37	17.3	15.2
% of Design Capacity—							
Based on Flow	103	84	110	90	43	50	50
Based on B.O.D. Loading	126	72	107	44	82	79	171

movals are shown in some cases. This does not mean that in such cases the units are detrimental or inefficient, but rather that the function of removing B.O.D. has been transferred to the clarifier or filter bed in circuit with the unit showing a negative or low removal. Another disturbing factor is the return of digestor overflow liquor to the primary clarifier. In army camp plants Nos. 2 and 3 and at Petaluma, this overflow was very high in solids and B.O.D.

At Healdsburg, the "special" flow sheet involves the flow of both primary and secondary filter effluents to the secondary clarifier. Primary filter effluent was also recycled to the primary clarifier, while secondary clarifier effluent was recycled to the secondary filter. Here both filters are seemingly adding B.O.D. rather than removing it. The primary clarifier, on the other hand, is seemingly removing more pounds of B.O.D. than originally existed in the raw sewage. Obviously this effect was produced by the very high recirculation ratios used. The actual total pounds of B.O.D. entering the clarifier was 1608, so that the removal based on this figure was 45.5%. Tests with only raw sewage entering the primary clarifier showed removals of 33.5%. Therefore, assuming this figure still held, the actual B.O.D. removed by the primary filter and post settling (in the primary clarifier) is 37.4%.

Except at Healdsburg where the recirculation ratio was high, the primary filter effluents in all cases had B.O.D.'s lower than those of the primary clarifiers. This indicates the superiority to flow sheet 2a.

Operation

The simplicity of Biofiltration plants is evidenced by the fact that most of the municipal installations in operation have no night operators. Their flexibility permits them to be used for varying the degree of treatment depending on seasonal and load requirements. The plant at Liberty, N. Y., is an excellent example. Here with a single day operator, continuous satisfactory service has been maintained since the plant went into operation in August, 1940. During the winter time when flows and sewage strength are low, the plant is operated as a standard filter plant. In the summer time when the load is increased, due to the influx of a large resort population, two-stage Biofiltration is practiced. Typical results reported by the operator on daytime composites collected hourly from 8 a. m. to 2 p. m. are given in Table 8. Flows during both periods averaged 0.60 to 0.70 m.g.d. These data show that the filter beds are quite efficient even when operated as standard units, although their depth is only 3 ft.

The adaptability of Biofilter plants to meet changing conditions makes this type of installation ideal for small plants. Indications that they were considered well suited for plants connected with our war effort is witnessed by the fact that almost 100 such plants have been installed within the past two years.

U. S. Army Camp Plant Using Flow Sheet 2a

Power Requirements

A particularly attractive feature of Biofilter plants is their low power consumption per unit of B.O.D. removed. Actual power consumptions are given in Table 7, and show that as high as 17.3 lb. B.O.D. may be removed per KW. hour. In this connection, a comparison with activated sludge practice is of interest. Assuming a 1.0 m.g.d. flow of raw sewage having a B.O.D. of 250 p.p.m., a

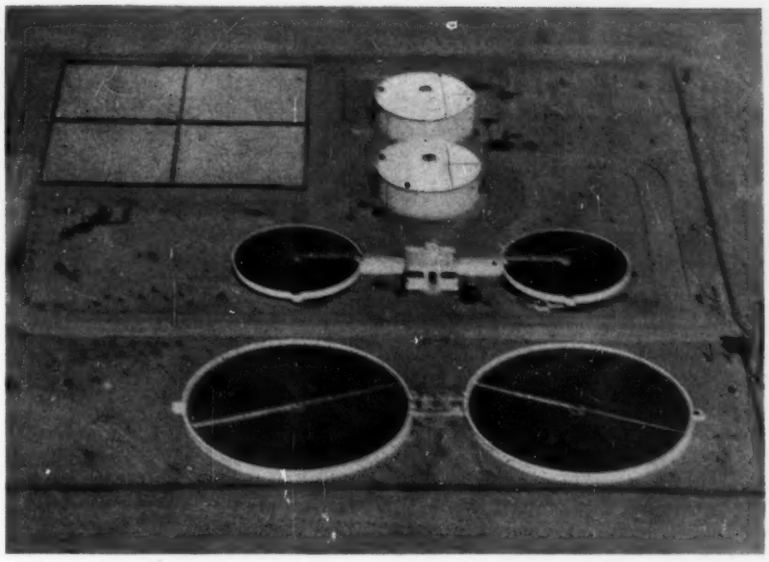
TABLE 8

Liberty, N. Y.—Comparative Data

Period	Two Stage Biofiltration Filters in Series* 9/14/'40—10/16/'40	Standard Filter Operation Filters in Parallel* 12/6/'40—2/28/'41
Suspended Solids (p.p.m.)—		
Raw	215	228
Pri. Effl.	60	90
Sec. Effl.	8.5	21.3
Final Effl. (filtered)	1.3	...
B.O.D. (p.p.m.)—		
Raw	360	342
Pri. Effl.	111	192
Sec. Effl.	12.6	42.9
Final Effl. (filtered)	4.9	...
Dissolved Oxygen (p.p.m.)	6.4	4.3

*The Liberty filters being operated as "high-rate" units when the seasonal load is high and as standard units the period of low plant loading.

most optimistic power requirement figure for good aeration and return of sludge would be 20 H.P. With an effluent of 20 p.p.m. B.O.D. the pounds of B.O.D. removed per KW. hr. would be 5.4. To give comparable results, a two-staged Biofilter plant using flow sheet 2a would be recommended with a recirculation ratio of 1.0 in each stage. This is conservative. With the filters located at a higher elevation than the clarifiers, the total input power would be 10.8 H.P. The B.O.D. removed per KW. hr. would, therefore, be 10.0 pounds. If sufficient head were available to allow gravity flow through the plant, the power would be reduced to 9.0 H.P. and the B.O.D. removed per KW. hr. would increase to 11.9 pounds.



Biofilter Plant of Santa Paula, Calif. (Employs Flow Sheet 2b)

Future Outlook

A little over a year ago the writer in an article predicted that Biofilters were here to stay, but that their acceptance for large plants would be held in abeyance until long time reliable data had become available. Since then a 6.0 m.g.d. plant has been placed in successful operation, while others up to 20.0 m.g.d. have been contemplated. These will undoubtedly go ahead immediately after the war.

At this time there appears to be no limit to plant size and high rate—high capacity filtration as exemplified by Biofiltration is taking its rightful place as a recognized method of secondary treatment.

"Thar's Rubber in Them Thar Sewers"

T. C. Schaetzle, Supt. of Akron's Sewage Treatment Plants, has taken on one of the most important jobs that any sewage plant operator has ever had.

In years past we have heard of recovering from sewage a variety of products of potential worth. Until now the most important has been gas for power generation, and, next, solids for use as fertilizer and soil improvement. Also from industrial sewages grease recovery has reached greater importance than heretofore. But of all products of value for the duration we must hand the palm to the Akron authorities in their present endeavors in developing fine-tooth comb methods for the reclamation of rubber from the sewage reaching the Akron Treatment tanks from the many rubber goods factories and rubber reclamation plants of this "City of Rubber."

It is reported that it is believed that probably as much as 2,000 tons of rubber per year can be recovered from the sewage of Akron for return to the manufacturing plants. At present Mr. Schaetzle and his associates have nothing more important on their docket than the recovery of rubber from Akron's sewage. In normal times we have seen lost rubber coming down to the Akron plant in chunks that could be "recovered" with nothing more than pitchforks and rakes, but nobody wanted it then—least of all Mr. Schaetzle. Now we imagine that in the present situation a fine-tooth combing, in fact, will be required to recover any such quantity as 2,000 tons per year of rubber from Akron's sewage, but we understand that much progress has been made already in the recovery program.

This leads to another thought which was brought forcibly to the writer while visiting George Schroefer's plant at St. Paul, Minn. At the time a considerable of a pile of rubber-containing products had been accumulated at the plant from the screen racks for turning in as rubber scrap. The thought came to this writer that if the same thing was going on at every sewage plant in America what an added increment of rubber scrap could be credited to sewage treatment—what a nice contribution from sewage works operators to the war effort. And we take it that if fine screening of sewage was a more prevalent practice that the net return in reclaimed rubber might prove of magnitude beyond conception.

Of course it would take many plants and many billions of gallons of sewage to equal the potentialities at Akron—but remember that there once was a nursery rhyme that had to do with those little drops and grains which collectively made the mighty ocean. Let's add something to Akron's pile, and to the job which Uncle Sam is getting set to do on those responsible for our rubber worries, amongst others.

Federal War Insurance Available to Citizens

Utility systems, public buildings and other municipal structures and equipment may be covered by the new War Damage Insurance.

Any political subdivision may purchase this type of insurance (fostered by the Federal War Damage Corporation) through fire insurance companies cooperating with the government.

The rate for this protection against loss or damage created by air-raid attack or other enemy action is very low. Such insurance does not, however, protect against damage resulting from sabotage or looting.

N.E.W.W.A.'S ANNUAL MEETING

Pared Down to Conference on Wartime Problems

Reported by HARRY A. FABER
Associate Editor

NOTABLE for its absence of manufacturers' exhibits, entertainment reduced to the Annual Dinner and floor show, and a shortened program devoted principally to wartime problems and practices in water supply was the 1942 Annual Meeting of the New England Water Works Association on September 15th and 16th in Boston, proved successful and well worth while. The registered attendance figure of 483 does not tell the story, for there were present a higher percent of operating men than is ordinarily the case and a smaller number of manufacturers' representatives than usual.

Presidents

(Retiring)
F. H. Kingsbury, Prin. Asst. Engr., Mass. Dept. Health, Boston

(Incoming)
Harold L. Brigham, Superintendent, Water & Sewerage, Marlborough, Mass.

Because of war conditions, earlier plans made to hold the convention at Poland Springs, Maine, were cancelled late in the summer and the pared-down meeting arranged for Boston. That the decision not to cancel the 1943 meeting completely —once under serious consideration— and the arrangement of a conference type meeting in Boston was a wise one, was attested by the number which came to the meeting and the noteworthy attendance at technical sessions and attentive interests shown in discussions of wartime problems, priorities, and policies of the War Production Board regarding water utility operation and maintenance and the matter of re-distribution of the excess stock of supplies and equipment now in water utility inventories over and above the permissible figures stipulated in W.P.B Order P46.

The State of the Association

The report of the Secretary and Treasurer revealed that the membership had increased slightly to a total of 808 members as compared with 798 a year ago. Although the income for the year failed to meet all expenditures the Treasury still contains $18,000 as surplus, it being later voted to invest $10,000 of the amount, now in savings bank accounts, in Series G War Bonds.

The report of the Editor, rendered by Professor Fair, revealed that $4,053 had been spent in producing the N.E.W.W.A. Journal during the year. This firm represents an expenditure of $5.36 per member as Journal production cost. However, Journal income — for advertising mostly — brought the net cost down to $534 — or only 71 cents per member for the year.

The Finance Committee (Dan M. Sullivan, chairman) voted a reduced operating budget for 1942-1943 and a special appropriation of $500 to be used in the effort to collect information on water works inventories and in re-distribution of that part of such inventories cataloged as surplus under requirements of the W.P.B. Order P46.

Committee Reports and Actions

Specifications for Elevated Tanks and Handpipes as printed in the Dec. 1941 issue of the N.E.W.W.A. Journal, were adopted as standard specifications of the Association.

Specifications for Disc Meters, as printed in the Dec. 1941 Journal of A.W.W.A are to be printed in the N.E.W.W.A. Journal and voted upon thereafter. These new specifications are the product of the Joint Committee representing the American and the New England Association, Richard Ellis acting as chairman of the New England group on the Joint Committee.

Medalist
Gordon M. Fair, Prof., San. Engr'g., Harvard Univ., Cambridge

No. 1 Guest
Arthur E. Gorman, Chief, Water Sec., Power Div., WPB, Washington

In the matter of the recently adopted specifications for Fire Hydrants, drawn by a Joint Committee of A.W.W.A. and N.E.W.W.A., some operators seemed to think the thickness of the hydrant barrel too little. However, it was voted to continue the specifications until less war worries make it possible to more carefully consider the matter of barrel thickness under actual test conditions. On this committee Roger Esty is the New England group's chairman.

Vice-Presidents

(Senior)
Horace L Clark, Supt. & Gen. Mgr., Sanford Water Dis., Sanford, Me.

(Junior)
Karl R. Kennison, Chief Engineer, Metro. Water Com., Boston

The report of Arthur D. Weston, as chairman of the committee on Defense presented an excellent general picture of status, developments and progress in the Mutual Aid plan in the several New England States.

It was reported by the Committee on New U. S. Treasury Standards for Drinking Water that the final revision of the new standards had been completed by the U. S. Public Health Service and now were acceptable to the committee.

Medal to Fair

The Dexter Brackett Medal, which goes to the author of the outstanding technical paper printed in the Association Journal during the year, was received by Gordon M. Fair, Professor of Sanitary Engineering, Harvard University. This paper on "Hydraulic Investigation of Water Distribution Systems in Field and Office" was published in the June, 1941, issue of the N.E.W.W.A. Journal. Since the principal accomplishments of Mr. Brackett had been in

Program Chmn.
Joseph C. Knox, Senior Engr., Mass. Dept. Health, Boston

Awards Comm.
Geo. A. Sampson, Consulting Engr., Weston & Sampson, Boston

Director
Arthur L. Shaw, Consulting Engr., Metcalf & Eddy, Boston

Director
H. W. Griswold, Deputy Chief Engr., Water Bureau, Hartford, Conn.

Director
Don Calderwood, Engineer, Water Works, Nashua, N. H.

Sec'y & Treas.
Frank J. Gifford, N.E.W.W.A., Statler Bldg., Boston

design and operation of distribution systems, Professor Fair expressed particular gratification in accepting the award. Its appropriateness was commented upon also by George A. Sampson, Boston, a member of the award committee, who presented the medal in the absence of John R. Baylis, chairman of the committee.

Election of Officers

President

Harold L. Brigham, Superintendent, Water and Sewage Commission, Marlboro, Mass.

Vice-Presidents

Horace L. Clark, Superintendent, Water District, Sanford, Maine.

Karl R. Kennison, Chief Engineer, Metropolitan Water Supply Commission, Boston, Mass.

Secretary-Treasurer

Frank J. Gifford, Cambridge, Mass.

Directors

Donald C. Calderwood, Nashua, N. H.

Harold W. Griswold, Hartford, Conn.; A. L. Shaw, Boston, Mass.

Technical Sessions

An address by Col. Henry C. Hall, Director, War Dept. Civilian Protection School, Amherst College, Amhert, Mass., was scheduled for presentation during the luncheon but was given during the subsequent technical session. Col. Hall described the accomplishments of this school organized to "instruct instructors." Held at Amherst College. The concentrated course provided 65 hours of lecture and laboratory study in nine and one-half days. Over seven hundred graduates have been trained in the various technical aspects of protecting non-combatants, a primary consideration in modern warfare. The availability of such qualified personnel will constitute a distinct contribution to civilian defense, should the need arise.

Gorman of WPB Evaluates Water Utilities

"Water—A Critical War Material," by Arthur E. Gorman, Chief, Water Supply Section, Power Branch, War Production Board, Washington, D. C.

Because water is a basic commodity, it may well become a critical material and already threatens to create a production bottleneck in certain industrial areas. Machines. manpower, and processing operations all depend upon water; an adequate water supply depends upon nature, upon man, and upon critical materials. Our high plane of living has meant an abundance of water at low cost; but if the war is a long one, our water consumption may be restricted.

Mr. Gorman pointed out that stringent conservation measures have already been required because of deficient rainfall, lowering of groundwater levels, and lack of critical materials. The abnormal use of groundwaters by defense plants has threatened to rob other consumers or to bring about encroachment of salt water. Too, there is a desperate challenge of critical materials necessary for construction or operation of water systems.

This situation demands a super-war-consciousness on the part of authorities: to eliminate the submission of unneeded applications, to stimulate Yankee ingenuity, and to encourage cooperation. Self-aid may lower demands by requiring reuse of water in air conditioning systems and in cooling towers, by the elimination of lawn sprinkling, and in many other obvious procedures.

To assist the war Production Board in expediting the nation's war effort, Mr. Gorman recommended that officials should cooperate with state coordinators in maintenance of accurate inventories; cooperate with industrial consumers in order to reduce the use of critical materials for private water systems; make priority applications complete and spe-

(1) (2) (3) (4) (5) (6) (7)

(1) *Wm. R. Conard, Engr.-Consultant, Burlington, N. J. ("Uncle Billy" to his friends)*

(2) *Henry E. Halpin, Engr., Factory Mutual Cos., Boston*

(3) *Chas. G. Richardson, Sales Mgr., Builders-Providence, Providence, R. I. (Proud wearer of Army-Navy "E" emblem)*

(4) *Theodore L. Bristol, Pres., Ansonia Water Co., Ansonia, Conn.*

(5) *Wm. J. C. ("Scottie") Marshall, Supt. of Water, Georgetown, Mass.*

(6) *Mark F. Croker, Supt. of Water, Newton, Mass.*

(7) *Stuart E. Coburn, Chief Chemist, Metcalf & Eddy, Engrs., Boston*

cific, "first having cleared the request through your own conscience." By good maintenance, early repairs, and salvage, prolong the life of existing equipment; prevent a shortage of supply by planning a water conservation program for your system; if acute shortages are anticipated, consult the WPB and all possible aid will be given in developing a program of preventing shortages.

Since his appointment to the WPB last July, Mr. Gorman has been on leave of absence from his position as engineer in charge of water purification for the city of Chicago. Mr. Gorman's co-worker, who has charge of 46 orders, Paul B. Valle, followed Mr. Gorman by describing the functions assigned to the WPB power branch by Donald Nelson in January, 1942. Utilities services are to be provided when and where needed, with a minimum use of scarce materials. Stocks of utilities are to be reduced to a safe minimum. Mr. Valle replied to a number of specific questions from members regarding priority procedures, materials, stocks, etc.

Symposium on Water Works Materials

While war conditions prevented the usual exhibition of manufacturers' equipment, the technical program provided an opportunity for industrial representatives to discuss the availability of their products. A symposium for this purpose was planned by Arthur T. Clark, Manager, Water and Sewage Works Manufacturers Association. R. K. Blanchard, Vice President of the Neptune Meter Co., New York, acted as chairman. It is unfortunate that only a brief resume of the comments can be presented in this report.

Meters: Due to their importance in conserving water, meters are classed as a necessity, but restrictions on copper have limited production. Plants where meters were manufactured have been devoted, in part, to the production of other needed equipment.—*R. K. Blanchard,* Neptune Meter Co.

Speakers

Fred J. Reny, General Manager, Port. Water Distr., Portland, Maine

Col. L. E. Moore, U. S. Engineers, First Command, Boston

Storage Tanks: In summary, no steel tanks are available, as the WPB prohibits all use of steel for tanks under 100 ft. in height, even for government projects. Wooden tanks or larger mains are recommended as a substitute.—*J. A. Morley,* Pittsburgh-Des Moines Steel Co., New York.

Hydrants and Valves: As both of these appurtenances are of recognized necessity, they are of reasonable availability. Only approved materials can be supplied and these on proper priorities.—*Denis F. O'Brien,* A. P. Smith Mfg. Co., East Orange, N. J.

Service Line Materials and Fittings: Copper tubing is one of the most critical of materials at present, while lead pipes and fittings are fairly easy to obtain. Strict adherence to regulations and full cooperation will ease the situation.—*M. E. Henderson,* Mueller Co., New York.

Chemical Control and Feeding Equipment: Because critical materials are required for the equipment in this field, a very high priority rating is essential to obtain it; ratings now available to water plants are too low. The use of substitute materials will be required. Nevertheless, equipment needed in a real emergency can be supplied and the priority question can be settled after the emergency.—*F. C. Clement,* Wallace and Tiernan Co., Newark, N. J.

Cast Iron Pipe: Monthly allocations of this material are more important than the priority rating since they determine availability. In the eastern area a priority of A-1-k may be sufficient, but in the south where pipe is even more scarce, an AA-4 or higher is required.—*H. Lloyd Nelson,* U. S. Pipe and Foundry Co., Philadelphia, Pa.

Steel Pipe: This is another confused situation since any order with a priority of A-10 or better must be accepted, but no steel mill can ship steel with a rating below A-1-a.—*E. H. Thwaits,* American Iron and Steel Institute, New York.

Asbestos Cement Pipe: Military construction such as munitions plants, shipyards, cantonments, etc., carry such high priorities that the manufacturers are unable to supply pipe for civilian orders. The WPB gives high priorities to only the most vital orders.—*C. T. Dearborn,* Johns-Manville Sales Corporation, Boston, Mass.

The Superintendent's War Time Problems

Under the general title of "War Time Problems of the Water Superintendent," three papers were presented. Harold L. Brigham, Superintendent, Water and Sewage Commission, Marlborough, Mass., and President-elect of the Association, acted as chairman of this symposium.

"Guarding of Public Water Supplies," by Col. Lewis E. Moore, U. S. Army, Headquarters First Service Command, Boston, Mass.

Utilities, public or private, must bear the responsibility of guarding their facilities. There is no practical protection against direct bombing, but sabotage can be prevented. Eternal vigilance over those who have access to vulnerable equipment must be maintained. In a serious emergency, the state guards and military may be called upon.

(1) (2) (3) (4) (5) (6) (7) (8)

(1) *Earl Devendorf, State Water Coordinator, Albany, N. Y.*

(2) *Paul Blampied, J.-M. Sales Engr., Providence*

(3) *J. W. ("Bill") Wickwire, Genl. Mgr., Edson Corp., Boston*

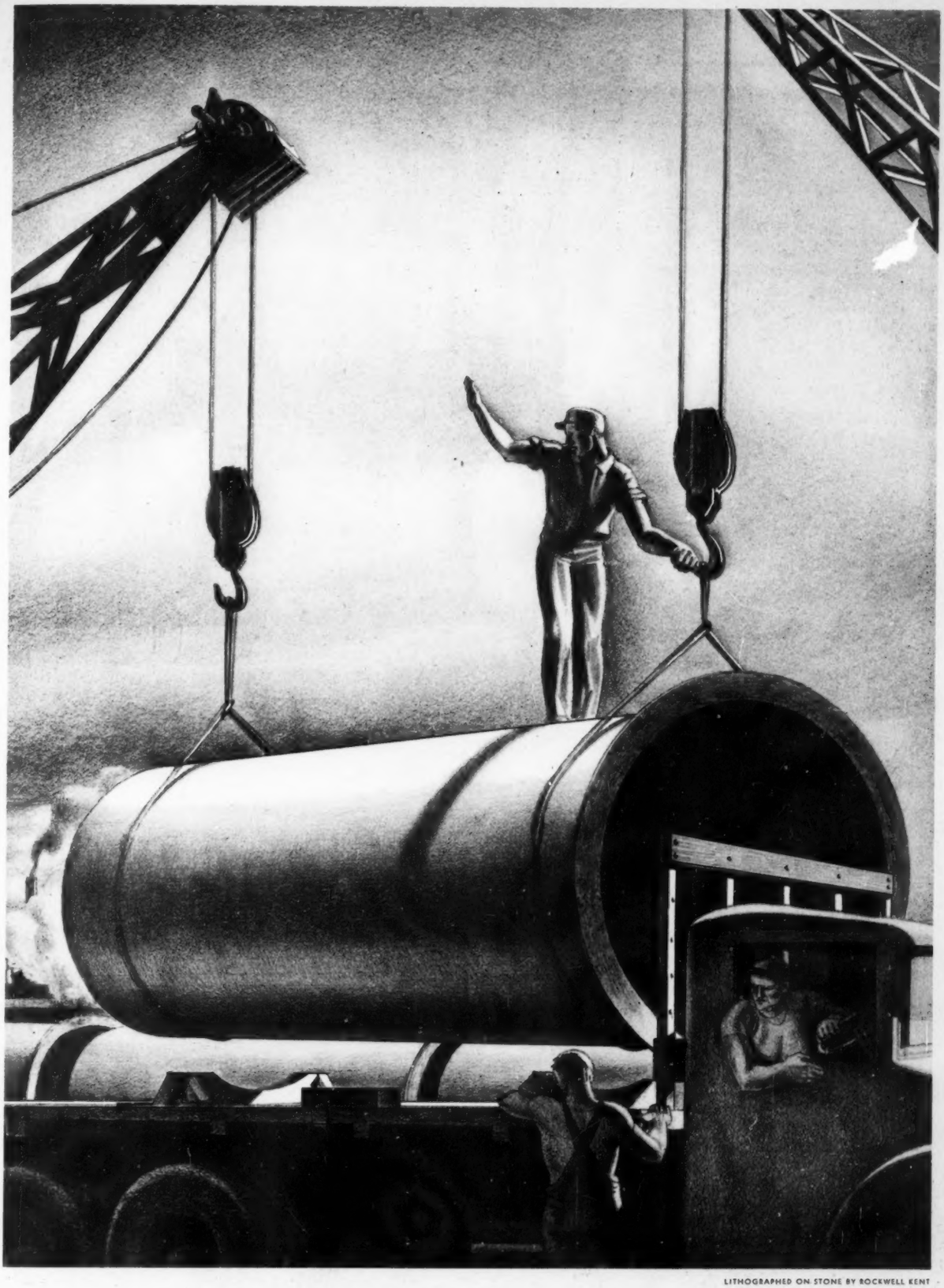
(4) *Michael E. Quirk, Supt. of Water, Peabody, Mass.*

(5) *Fred O. Almquist, Sr. Engr., Conn. Dept. Health, Hartford*

(6) *John J. Vaughn, Genl. Mgr., Norwood Filter Co., Florence, Mass.*

(7) *Thurman Dix, Supt. of Utilities and City Engr., Barre, Vt.*

(8) *A. F. Dappert, Asst. State Water Coordinator, Albany, N. Y.*



LITHOGRAPHED ON STONE BY ROCKWELL KENT

UNITED STATES PIPE AND FOUNDRY COMPANY

BURLINGTON, NEW JERSEY

America's Largest Producer of Cast Iron Pipe for

Water, Gas, Sewerage, Drainage and Industrial Service

* This illustration shows the "Impact Test" to determine the toughness and ductility of the pipe. While under hydrostatic pressure the pipe is subjected to heavy blows from a 50-pound hammer dropped from successively increased heights. Although not a required acceptance test, it is one of the additional tests regularly made by this Company to further check and maintain the quality of its pipe so that it will adequately meet severe service requirements.

* One of a series of controls in operation at each of our plants, beginning with inspection and analysis of raw materials and ending with tests of the finished product, all subject to the central control of our headquarters staff at Burlington.

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PIPE

Centrifugally or Pit Cast for water, gas, sewerage, drainage and industrial services.

(1) (2) (3) (4) (5) (6) (7) (8)

(1) *Clarence B. French, Supt., Water & Sewerage, Waltham, Mass.*

(2) *Joe Fitzsimmons, Sales Engr., Kennedy Valve Co., Boston*

(3) *Henry F. Hughes, Supt., Water & Sewerage, Medford, Mass.*

(4) *Elisha J. Dionne, Registrar, Water Dept., Salem, Mass.*

(5) *Nelson C. Smith, N. Y. Repr., Ludlow Valve Co., Troy, N. Y.*

(6) *Prof. Edw. W. Moore, Harvard Univ., Cambridge, Mass.*

(7) *Leo E. Desmond, Eastern Mgr., Universal Fdy. Co., New York City*

(8) *Roger G. Oakman, Supt. of Water, Needham, Mass.*

It should be realized that fences merely serve to reduce the number of guards required. Two guards are four times as effective as one alone, and quick reinforcement must be provided for. Regular telephone reports should be required, since cutting of wires is generally easy. Shotguns are of little value, rifles and pistols must be of at least medium calibre to be effective. Floodlights should illuminate approaches and leave guards in the dark.

Mfgr's. 'Prexy'
Dennis O'Brien, Pres., A. P. Smith Mfg. Co. (Pres. of the Mfrs. Assn.)

Priorities Leader
Rollo Blanchard, Vice-Pres., Neptune Meter Co. (Priorities Symposium Leader)

Col. Moore pointed out that local situations will determine proper guarding recommendations, and that U. S. Army headquarters are very willing to cooperate in planning such procedures with utilities, but will not provide guards.

"War Time Problems in the Portland Water District," by Fred J. Reny, Director and General Manager, Portland Water District, Portland, Maine.

Mr. Reny described the magnitude of the task of guarding a system which extends from Sebago Lake seventeen miles to Portland, and within a 20-mile area square. Personnel, its selection, investigation, and education, was the beginning point. The area to be protected was zoned and a capable individual was placed in charge of the necessary men and equipment for the area. Two men, sworn in as deputy sheriffs, act as guards on each shift at strategic points. Fences, floodlights, signs, and telephone communication at each guard station, have been installed entirely by employees of the water utility.

Cost of this protection is $500 to $600 per week. Full cooperation with the local Office of Civilian Defense recommendations and practice preparations have been carried out.

While this utility cannot now provide its "super-service" to consumers, it is doing very well under the load of population increase: twenty-seven thousand shipyard workers have been added and must be served. Portland was prepared—according to WPB too well prepared—with materials before the war.

"Repairs to Broken Pipes," by George R. R. Wahl, Engineer, Transite Pipe Department, Johns-Manville, New York.

By means of an unusually well selected series of lantern slides, Mr. Wahl showed types of damage to water mains and distribution systems caused by bombing in Great Britain.

"Men from Maine"

Ralph B. Manson, Genl. Mgr., Caribou Water Co., Caribou, Me. (Vice-Pres., Maine Water Utilities Assn.)

Sam D. Soule, Supt., Water District, Gardner, Me. (Dean of Maine "Supers" with 51 years of service at Gardner, and 36 years as Supt.)

Earle A. Tarr, Supt., Water District, Winthrop, Me. (Secy.-Treas., Maine Water Utilities Assn., since its organization)

Additional slides illustrated methods and equipment suitable for repair work, both temporary and permanent. A brochure describing the procedures in text and line drainage of exceptional clarity is available from the Johns-Manville organization, and would appear well worth investigation.

(1) *P. S. Wilson, Sanitary Engr., Glen Ridge, N. J., and H. W. Jacobs, President, Cement Lined Pipe Co., Lynn, Mass.*

(2) *Eben P. Lufkin, Boston Mgr., Pittsburgh-Equitable Meters, and Don Calderwood, A. Mgr., Pennichuck Water Co., Nashua, N. H.*

(3) *Earl Devendorf, Asst. Chief Engr., and A. F. Dappert, Senior Engineer, N. Y. State Dept. Health, Albany, N. Y.*

(4) *Barney Carlson, Commissioner, F. M. Hennesy, Supt., and Geo. Fischer, Foreman, Water Works Comm., Northampton, Mass.*

(5) *John Vaughn, Gen. Mgr., Norwood Engineering Co., Florence, Mass., and F. M. Hennesy, Supt. of Water, Northampton, Mass.*

Contamination and Decontamination

"Training and Organization of Technical Consultants to Deal with Chemical and Bacteriological Contamination," by Leon A. Bradley, Head of Bacteriology Department, Massachusetts State College, Amherst, Mass.

Fear and panic of the civilian population may be a much greater hazard than the direct damage caused by contamination of water supplies, according to Professor Bradley. A training program has been under way for some time and this is devoted to providing local specialists to aid civilian defense organizations in decontamination work. These technicians are trained to recognize toxic substances by appropriate chemical tests, and to apply the proper treatment method. At present 172 technicians have received such training, and will act in a purely advisory capacity.

"Chemical Decontamination of Public Water Supplies," by Lazarus Rubin, Senior Chemist, Massachusetts Dept. of Public Health, Boston, Mass.

Toxic chemicals might be added to a reservoir either by a gas attack or by sabotage. War gases are chosen for their effectiveness against personnel, not for their effect on water. In general, about 100 p.p.m. concentrations of the various gases are required for fatal doses and, in a 100 million gallon reservoir, this would require the addition of over four tons of gas. Normal treatment by coagulation and filtration will remove some chemical agents.

Sabotage by means other than poisons would seem more effective. Non-specific tests to indicate the presence of toxic materials were given: pH, chlorides, oxygen consumed and chlorine consumed measurements. Mr. Rubin mentioned specific tests suitable for some contaminants and pointed out the difficulties of working with such materials. He explained that this is a new field of technology in which much research is under way.

"Bacterial Decontamination of Public Water Supplies," by Joseph A. McCarthy, Chief of Laboratory, Lawrence Experiment Station, Lawrence, Mass.

The training of technicians in this phase of civilian protection included the preparation of sample bottles, taking of samples, and the selection of emergency equipment. Tests with artho-tolidin and correlation of chlorine residuals with bacteriological results were demonstrated. Kits have been prepared to provide five sterile bottles, one containing culture media, and tests may be run without using pipettes. Several emergency incubation methods have been found satisfactory, and untrained personnel produce results which are comparable to those obtained by standard methods.

The possibilities of deliberate bacterial contamination were described as very slight, and the emergency methods were not to replace standard procedures, but the impression was carefully given that some procedure should be available in case of failure of regular facilities.

(1) (2) (3) (4) (5)

"Ambassadors of Commerce"

(1) *N. J. Kenny, Vice-Pres., Natl. Div., Pittsburgh Equitable Meter Co.*

(2) *Harry Prescott, Sr., President, Harry J. Prescott & Sons, Worcester, Mass.*

(3) *H. W. ("Jake") Jacobs, Gen. Mgr., Cement Lined Pipe Co., Lynn, Mass.*

(4) *Wm. F. End, Gen. Mgr., Ross Valve Mfg. Co., Troy, N. Y.*

(5) *Arthur R. Taylor, New England Mgr., Ludlow Valve Co., Troy, N. Y.*

At Least 185 Cities Make Charges for Sewerage Services

Special charges for the use of sewerage systems, are now made in 185 cities.

The high percentage of cities charging sewer rental lies in the cities above 100,000 population and in those between 10,000 and 25,000.

Among the large cities making the charges are Buffalo, Cleveland, Columbus, Dayton, Toledo, Dallas, Fort Worth, Detroit, Minneapolis, St. Paul, Seattle and Portland, Ore.

Basis for the charge in the larger cities usually is the metered water consumption or a percentage of the water bill. Cities between 10,000 and 25,000 population use a wide variety of bases for the charge and frequently employ several bases in combination. These may, include metered water consumption, number of plumbing fixtures and type of property.

Revenue received from sewer rentals by the reporting cities in 1941 varied widely according to the survey. Buffalo collected $1,728,600; Detroit, $1,376,800; Minneapolis, $505,000. Among the cities under 25,000, Bowling Green, Ky., received $48,200; Bloomington, Ind., $26,800; Grand Forks, N. D., $40,000.

More than three-fourths of the 185 cities, 77.3 per cent, have their own sewage treatment plants. Twenty-four of the cities without municipal plants are served by privately operated facilities, while 18 others are served by facilities of neighboring governmental units.

This information appeared in the City Journal of Toledo, Ohio.

How to Clean Glass Tubes*

I know that chemists will "wonder" when they read this, but I don't know of anything better for cleaning dirty glass tubes, including boiler gage glasses, than dilute hydrofluoric acid.

Soak the glasses in a 5 per cent solution of the acid for 15 to 20 minutes and then wash and rinse in clean water—preferably running water. Be extremely careful, though, because hydrofluoric acid dissolves nearly all substances, including glass. It does not dissolve lead and is therefore usually kept in containers made of lead.

Blowing out with filtered compressed air will then assist further—if you have such air. Usually the results are first class without the air blow finish. Nitric acid, also does very well, but hydrofluoric is betfer.

*Contributed by W. F. Schaphorst, M.E., Newark, N. J.

WATER–A CRITICAL WAR MATERIAL*

By ARTHUR E. GORMAN
Chief
Water Production Section, Power Branch
War Production Board
WASHINGTON, D. C.

IT is obvious that the impact of this war with its serious dislocation of our national economy and the diversion of man power from civilian to military and war production efforts would affect such a basic commodity as water and the services by which water is supplied for domestic, commercial and industrial uses.

I welcome this opportunity to present the viewpoint of the War Production Board relative to wartime water problems which appear to lie ahead; and to suggest ways by which water works officials can co-operate with the Federal Government to aid in solving these problems. The water works profession has been and is alert to its wartime responsibilities. In many ways it leads other professional groups in initiative and purposeful planning to meet the exigencies of war conditions. But with the prospect of a long war ahead and Pearl Harbor only nine months behind, it is timely and proper that we should appraise the results of our past efforts and strike the forward course based on conditions as they exist and those which we can forecast with reasonable accuracy.

The Responsibility of the Water Supply Industry

That water is a basic war commodity is a fact all water works men know well. That water is likely to become a critical war material you already may have suspected. But do you know that in certain sections of the country water supply deficiencies may cause severe bottlenecks in the nation's war effort? We of the water works profession have a deep responsibility to this nation; one which calls for profound patriotic planning of the most intensive character.

War production plants are calling for power and more power; the finished products for front line fighting require careful processing of raw materials; this calls for machines and man-power; machines must be repaired and replaced; men who operate and repair machines must be fed and housed; each of these items of our complex war effort-power, processing, machines and men with their food, housing, and safety requirements, is absolutely dependent on the commodity WATER.

The Author

To maintain efficient public water service requires maintenance of equipment and certain normal extensions to the water system. This calls for the use of critical materials. There are already desperate shortages on our most important of these water works materials. The restrictions already imposed on their use in order to conserve our limited supplies are certain to become even more stringent. These are plain facts we must face; and we should plan accordingly.

Water works officials in New England have been unusually alert to their war problems. You have co-operated splendidly in postponing normal betterments. And, by developing Mutual Aid Plans and in the pooling of inventories, are making it possible to extend the service of existing supplies for emergency use while limiting the purchase of additional equipment. There is some evidence that your Civilian Defense Program did add to normal inventories, but I understand that releases are now being made in order to cut back to the 1940 level as required under the P-46 Limitation Order.

Further Inventory Cutting Appears Inevitable

As a result of conferences held during this convention, it is expected that a co-operative program can be established which will make available to the War Production Board certain important records of critical material inventories compiled by State Water Supply Co-ordinators. At this time it is only fair to say, candidly, it is likely that water works inventories will have to be cut considerably below the present reserve on the 1940 basis before they can again be allowed to return to the liberal 1940 level. Most of you probably realize that under present conditions this is inevitable.

The call on many water works systems for additional service to war industries and to military establishments has been heavy. In some cities and districts this demand came early before materials were scarce. Facilities which were taxed to capacity were relieved by the installation of additional equipment or by making certain major extensions to the system. In other cities, however, the pinch of the war demand is just beginning to be felt and may not reach a peak until next summer. The hope of obtaining any considerable amount of critical material with which to provide assistance is diminishing.

Every effort will be made by the Power Branch of the War Production Board—which now initiates recommendations for critical materials to water works—to provide, from the reduced allotments for utility requirements, an equitable distribution of such critical materials to the water supply industry. In doing so, consideration will be given to the effort which water utility management has made to obtain effective capacity to meet additional consumer demands by reasonable water conservation programs. Certainly, priorities for materials and equipment to maintain pressures during ridiculously high maximum hourly demand peaks should not and will not be granted.

In some sections of the country the abnormal use of well water in new war plants is beginning to cause a serious recession of ground water, not only robbing other plants of their share of underground water, but threatening to curtail war production. Where vital war industries were concentrated and ground water shortages were threatened, the Federal Government in a limited num-

*A paper presented before the New England Water Works Association's Wartime Conference, Sept. 15, 1942.

ber of cases has arranged to finance projects requiring a minimum of critical materials to bring a supplementary supply of surface water into the area to relieve the heavy drain on the underground supply. Intrusion of salt water into fresh water aquafiers might prove disastrous to certain industries depending on fresh water from wells. Furthermore, corrosion of metals caused by the high salt content might destroy or damage vital operating equipment, with resulting delays in production and requirement of additional critical materials.

Public Supply Service vs. Private Supplies

There is evidence that in the past at many industrial plants critical materials have been used in the construction of wells when an ample and adequate supply of water was available from public systems having mains adjacent to these premises with capacity to meet the demands of the industrial plant for all purposes, including fire protection. Small differentials in rates between plants within and outside the corporate limits of a city have been the basis of decisions to construct wells rather than purchase city water. This type of economy at the expense of critical materials must not be repeated. A few hundred dollars extra each year for the purchase of city water is a small price to pay in order to provide the critical materials for more weapons for our soldiers at the front.

Let no one argue in such cases that the city might be delayed in getting materials to serve a potential consumer, when such service is justified. If the specific facts are brought to our attention promptly there is no occasion for serious delay under the priorities system. Present the complete economic picture as to critical materials and water service and supply, and we in the Power Branch will do our part in assisting you to obtain needed materials to serve any war industry whether the materials are requested under a PD-1-a or a PD-200 application.

If each of you could serve but one day as an analyst or as a priority expert reviewing the types of applications which many water works officials have sent in, you would have a full appreciation of some of the administrative difficulties involved. You would agree that many of these applications should never have been submitted. Others, while undoubtedly justifiable, one will find so vague and indefinite that to make a good appraisal of the necessity for the project or the equipment for which a priority rating is requested is a near impossibility. The filing of fewer applications will permit better processing and prompt action on essential ones. It is probable that some new forms for reporting the weights of such important critical materials as steel, cast-iron, copper, brass, bronze and rubber in summary form will be issued in the near future. They may also call for a schedule of the period during which these materials will be needed. This will permit better budgeting of supply to demand.

Under the acute strain of this war on both critical materials and man power, all of us must bring ourselves to a state of super-war consciousness; one which would forbid us to submit to the War Production Board a priority rating application for materials which we can possibly get along without. We need more Yankee ingenuity in making what we have been accustomed to call obsolete equipment serve another year or two. We have not begun to employ used materials or the general supply market to its full potentialities; nor are we salvaging equipment and parts to the extent we should be, considering the shortage of base metals.

The Question of Supply Itself

Our water resources should be guarded jealously during the period of this war where victory will only come when the enemy has exhausted his resources. If this war turns out to be a long one, there is a possibility that in certain critical areas where deficiencies of supply may develop, WATER, like other critical materials, may have to be allocated to assure an adequate amount for war purposes. Everyone is hopeful that allocation of water will not be necessary. But since it is a possibility, especially where underground and impounded surfaces supplies are used, water works officials should watch with care the effect of war demands on available supplies. They should plan a conservation program which should be put into effect progressively, and as required. Conservation methods applied early enough in a season may carry a system through a prolonged dry spell.

The use of water for air conditioning for comfort, the sprinkling of lawns every day of the week, and all non-essential flushing of streets from fire hydrants are special examples of where curtailment of use should be put into effect. Water should be used efficiently at all plants which require large quantities of it. Water should not be released to the sewer until it has served all possible useful purposes. If the supply is obtained from underground sources, means should be considered of making use of the spent water to help recharge the watershed.

How Water Works Officials Can Help Most

In conclusion, I should like to restate in summary form the following ways by which water works officials can help themselves and the War Production Board in its effort to expedite the nation's war effort:

1. Cooperate with your State Water Supply Coordinator in maintaining complete and up-to-date water work inventories.
2. Cooperate with all industrial consumers engaged in the war effort and render as complete service as possible from the public system, thereby making unnecessary the expenditure of critical materials for private water systems.
3. Do not apply for priority preference ratings unless you have cleared this request through your own personal priority system known as *conscience;* then make your application *complete and specific.*
4. Make a strong effort to prolong the life of existing equipment through good maintenance and early repairs; to put obsolete but serviceable equipment back into service; and to salvage as much critical material as you can.
5. Plan a water conservation program for your system. Keep accurate records of supply and demand in order that you may know where to apply this program to assure protection against a shortage of supply.
6. If you anticipate acute shortages consult the Power Branch of W.P.B. and we will do everything we can to assist in developing a program to preclude such an important development in the war effort.

Mr. Herbert S. Marks, Chief of the Power Branch, has asked me to extend to this association and the officers of its affiliated state associations his thanks and appreciation for the fine spirit of cooperation shown in New England toward the War Production Board in its administration of water utility services and especially for the cooperation of your state mutual aid coordinators in making the records of surplus water works inventories available.

RECIPIENTS OF THE GEORGE W. FULLER AWARD

(Those members starred were present to receive the honor in person.
The Sections voting it are indicated in brackets)

Robert W. Angus
(*Canadian*)

*Wm. T. Bailey
(*Missouri Valley*)

*Rollo K. Blanchard
(*New York*)

*J. Arthur Carr
(*New Jersey*)

**Jas. S. Dunwoody
(*Western Penna.*)

*Robt. P. Farrell
(*Ky.-Tenn.*)

*Douglas Feben
(*Michigan*)

*Ronald M. Finch
(*Minnesota*)

Herbert B. Foote
(*Montana*)

Wm. B. Gibson
(*Florida*)

*Herbert E. Hudson
(*Illinois*)

*Roberts Hurlbut
(*Michigan*)

Chas. G. Hyde
(*California*)

*Hayes R. Kuhns
(*Ohio—'42*)

Thos. R. Lathrop
(*Ohio—'41*)

*Carl J. Lauter
(*Four States*)

Milton H. McGuire
(*Pacific N W.*)

*Wm. D. Moore
(*Southeast*)

Wm. C. Olsen
(*North Carolina*)

*Walter A. Peirce
(*Wisconsin*)

*Blucher A. Poole
(*Indiana*)

*Oliver J. Ripple
(*Rocky Mountain*)

*Edw. R. Stapley
(*Southwest*)

Dayton R. Taylor
(*Virginia*)

*Thos. L. Young
(*West Virginia*)

**Deceased March 21, 1942, Mrs. Dunwoody attending to represent the spirit of "Jim" Dunwoody.

THE BOURNE WATER DISTRICT OF MONUMENT BEACH, MASS.

Has Some Practices and Problems a Bit Out of the Ordinary

By CHAS. J. CRUMP
DISTRIBUTION ENGINEER
BOURNE WATER DISTRICT
MONUMENT BEACH, MASS.

EARLY in 1938 a committee was formed of townspeople for the purpose of establishing a water system and engineers came in and made a survey of the territory to be supplied with water, a district having been formed by special act of the legislature providing for the establishment of the water system to supply the villages in the town of Bourne lying south of the Cape Cod Canal. The voters of the district declined to proceed under this authority at that time. Later, due to conditions left by the hurricane of September, 1938, it became apparent that the establishment of a community water system was absolutely necessary. Sea water had impregnated the soil to such a depth that practically all of the individual water supply wells along the coast line were contaminated by salt water; and, as a matter of fact, this condition still exists in those localities. Again the question was brought before the public, and a Water District Meeting was called in February, 1939. This time the installation of a public water supply system was voted.

Whitman & Howard, Engineers of Boston, drew up all plans for the installation of the new system, supervised its construction, which involved the laying of 31 miles of from 6 in. to 12 in. Bitumastic lined cast-iron pipe, the placing of 237 Protector Top hydrants, and 504 gate valves.

The Author

The Pumping Station is a one story brick building with concrete foundation and slate roof. It houses 1 Deisel driven centrifugal pumping unit of 800 g.p.m. capacity at more than 1,800 r.p.m. pump speed. For emergency and standby service there is 1 gasoline engine driven centrifugal pumping unit of 500 g.p.m. capacity at more than 1,800 r.p.m. Amongst other equipment that becomes part of a pumping plant are the vacuum and air pumps and an emergency chlorinator, etc.

Pumping Station—Bourne Water District

Source of Supply and Storage

The source of supply is three gravel packed wells 75 ft. deep. It was found that after these wells had pumped 24 hours per day for 31 days they had an output of 900 g.p.m. There are two elevated tanks. One holds 250,000 gallons and the other 200,000 gallons. These tanks are 236 ft. above sea with a minimum pressure of 67 lbs. and maximum of 90 lbs.

In the early stages of construction of the plant it was demonstrated that due to the abnormally high pressure and the difference of elevations extending over 15 miles, there was need for placing 3 relief-valves to dampen the heavy surge in the mains to avoid the breaking of meter bottoms and rupture of surface lines.

Good Hydrant and Valve Records

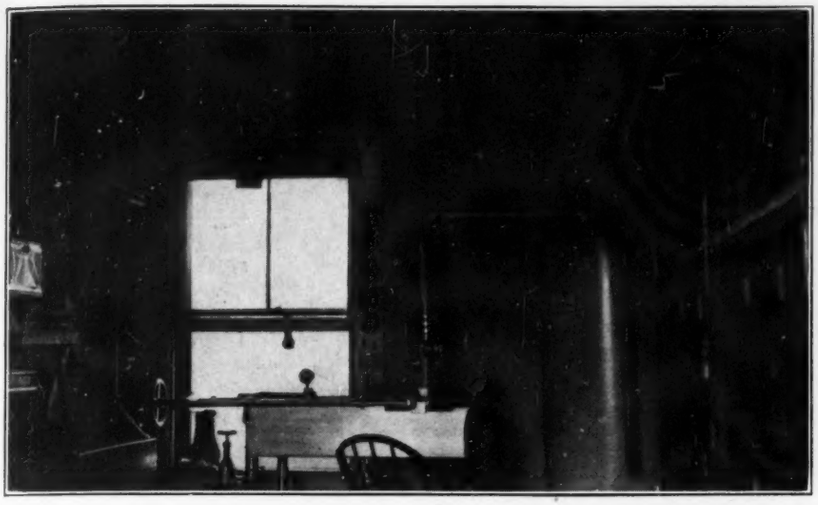
All hydrants are numbered on their face with a ⅜ in. die-stencil and are so designated on our master plan of the system and also on the plans in the Gate-Books.

All gate-boxes have numbers painted on the inside of the box cover. These are recorded on the master plan and in the Gate-Books. All gates can be located at a moments notice. These records have been completed to the last detail for the purposes of meeting any emergency either in peace or war-time. All hydrants are being inspected semi-annually.

The system is operated through the close co-operation of three men who have had previous experience in the operation of water-supply systems. There is one additional employee, a Secretary of the Board, who is in charge of consumers' accounts, etc.

Field and Shop Equipment

The Commissioners with foresight provided sufficient equipment to properly carry on the work, including a 1½ ton truck with a pipe rack and a crane. The latter is used to excellent advantage in maintenance and repair of hydrants. The



Meter Room—Test Bench and Portion of Meter Storage Shelves

crane construction is such a simple matter that we believe it should be of interest to all small water system operators. For that reason we are supplying a picture of it. Also supplied is a picture of our meter rack which provides for the winter storage of 364 meters of ⅝ in. size. It will be noted that the rack provides the proper storage position for meters with oil enclosed gear trains.

Our Meter Room is equipped with a meter tester for sizes from ⅝ in. to 2 in. inclusive and a 24 hour recording pressure gauge. We also have a gauge located in the nearest fire-house. If there occurs any abnormal drop in pressure an alarm bell rings and the Distribution Engineer is notified promptly.

At least 90 per cent of the service lines are laid in a sandy soil and the Distribution Engineer, with additional help for ditch work, lays all services from the main to the street line. In connection with this work, we use a Chicago Pneumatic two-stage air compressor, used in many cases to push a service under the main highway. This has saved us from making many openings in the macadam road. Its use avoids interruption to traffic, and has been found to be an excellent investment.

Two-Tank Distributed Storage a Boon

Under war-time conditions the District is particularly fortunate in having its two-tank storage. The District extends about 15 miles from one extreme end to the other and the tanks are so located that through inter-connection of the mains along the main highways, an ample supply of water can be had (even to the extent of fire protection) should a casuality occur short of putting both tanks out of commission at one time.

As an additional war emergency precaution we are connected at the town line in Cataumet to the 6 in. pipe of the Town of Falmouth, whereby either system can supply the other if needed.

Perpetual Inventory Kept

Work orders are issued covering all installations and repair work, and a material account report is made on each piece of work performed, showing cost of material used in detail and labor costs.

A perpetual book inventory is kept which is checked against an actual count of stock at end of the year.

The District, without charge to the consumer, lays all supply services from the main to the property line. The customary service is a ¾ in. tap and 1 in. cement-lined pipe.

Twenty-seven services have been installed this year (averaging 19 feet each) at an average cost of 94 cents per foot for material and labor.

All mains were laid at a depth of 4½ feet, which has been found ample protection; all joints were made with jointing compound and at this writing no leaks have come to our attention. We have a total of 607 consumers, amongst which 361 take water only during the summer. Because of the latter circumstance 250 meters have to be removed for winter storage and water shut off, due to the fact that in most cases these buildings have no cellars. We have 87 meters housed in a double-cover Ford Meter Box and in no instance have we had one to freeze. Actually, 60 per cent of our services are summer services supplying water to eight villages on the south side of Cape Cod Canal, with a winter population of only 1,200 and a summer population of 6,000.

Service and Valve Location Records

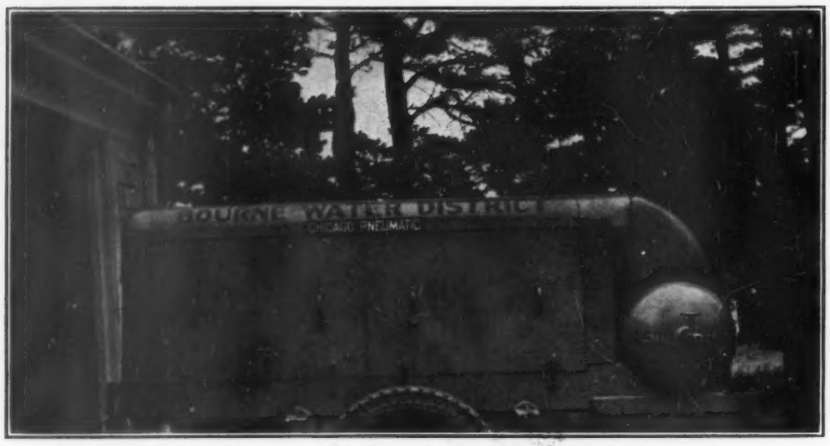
We have a complete set of blue prints 4½ in. by 10 in., covering all service taps made. These records are kept up to date, and this is also true of all main valves from 1½ in. to 12 in. on the distribution system.

In addition to the small blue print plans we have 110 sectional plans 10 in. by 30 in., drawn to a 40 foot scale, which show a complete layout of the system including the location of all houses with property owner's name. This enables us at a moments notice to determine the exact location of property for which we have frequent inquiry by mail from out of town owners desiring to learn whether water is available at their location.

As soon as a house is supplied with a tap, the account letter and serial number is added to the blue print at its proper location.

Having no sidewalks, the plans are continually in use to assist in locating the stop at the property line of the various width streets. We have prepared an index to these plans,

1½ Ton Utility and Service Truck Equipped with a Highly Useful Swinging Arm Crane



Compressor—Capacity 120 c.f.m. at 100 lbs. (A unit of many uses.)

listing all properties on the water line, whether supplied or not. This we find is of great assistance for use in connection with new taps to be made and locating property where there are changes of ownership, which occurs frequently on sales of summer property.

Rates and Billing

All year round consumers are billed quarterly on minimum charge basis of $24.00 per annum for 40,000 gallons of water plus a $1.00 charge for meter rental.

However, it was found that this method of billing summer property services was not effective, and it soon became apparent that after the first two quarters of the year were billed and paid that it was extremely difficult to make collections before the following year, making it necessary to borrow funds for operating purposes. This condition has been overcome by billing the full annual rate each year on January 1st, making it obligatory that the account be paid on or before July 1st, with further proviso that the service will be discontinued on that date if not paid for in full by that time. This regulation has worked splendidly and it has resulted in the payment of the full annual charge during the months of January and February by many of the consumers and provides ample revenue for several months operations.

Meter Storage Shelves

Each of the services in the eight villages is given an independent alphabetical and serial number, eliminating many causes of confusion in the locating of properties and in the storage of meters. Needless to say, the changing of ownership of properties, which occurs so frequently in resort areas, has always been a headache

We die stencil on the inside cover of the meter the identification letter and number referred to previously. On each service we attach a permanent brass tag giving the same information. In this way it is assured that the 250 meters stored during the winter months will find their way to the proper service location.

Management and Finances

The bonded indebtedness amounts to $560,000. The control and operation of the system under the District Charter provides for the establishment of a Board of three Water Commissioners.

The District acted wisely in the selection of these men, all of whom were business men and free from all political consideration. The various contracts covering the laying of mains, installation of tanks, pumping equipment, supply of meters, and all major items of expense, were carried out under contract, and in each instance awarded to the lowest bidder. We believe it a rare occasion when an undertaking of this kind is accomplished with less than the estimated cost by approximately $30,000.

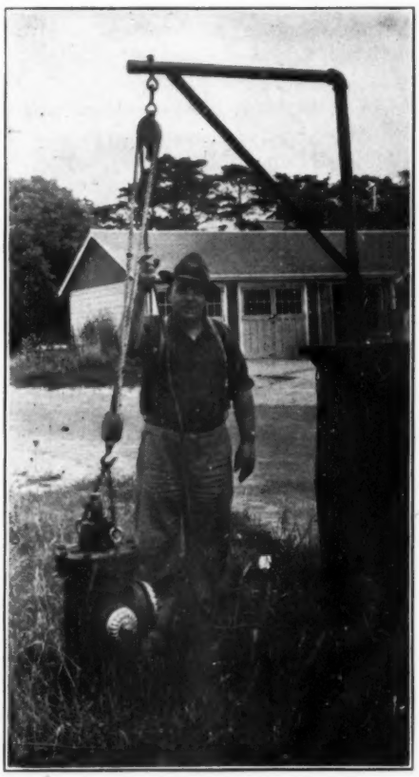
From the beginning the water revenue has been sufficient to pay all operating costs and leave a substantial balance that has been applied to payment of interest charges on the bonded debt.

However, the added cost for providing guards, additional equipment, etc., in that relation, has so increased costs that there will be only a small balance this year above operating costs.

It has been the policy of the District to make purchases where practicable upon a competitive price basis, with the result that there has been a substantial saving on the purchase of materials. In addition all trade discounts allowed for prompt payment of bills, has been taken advantage of.

An audit of the accounts each year is made by an outside accountant.

Whitman & Howard of Boston were the Engineers; Charles L. Shea of Dedham, General Contractor, supplied all pipe and fittings, hydrants and gates, etc.; Pittsburg-Des



Here the Author Is Demonstrating the Swing-Arm Crane

Moines Co. installed the two elevated tanks; Ralph Hall Co., Boston, the pumping equipment; Layne-Bowler, gravel packed wells.

In the preparation of this article it is recognized that there will be very little of interest to readers who are connected with the operation of large city systems, but we do believe that it will be of interest to the many localities that have a large summer population problem to deal with. If any further information might be useful it will gladly be supplied.

Rules and Regulations

Considerable study and research was given in the preparation of regulations and rules issued to consumers. These contain some variations from the usual set of rules issued to a year round population and portions are reproduced herewith. However, we shall be glad to mail a complete copy of these regulations to any person interested in having them.

Excerpts from Rules and Regulations, Bourne Water District, Monument Beach, Mass.

Service Installations

All ordinary service connections will be laid at the expense of the District to the property line, where a curb stop and waste valve will be placed.

At the option of the owner of the premises, pipes and necessary fittings may be placed by the District at a fixed rate of charges up to the point of a suitable location for a meter, at rates of charges then in force by the District Board. All ditches to be 4½ feet in depth.

On all services laid from property lines into the premises, not laid by the District Board, the ditch to remain open for inspection by a representative of the Board before refilling. Pipe to be either Cement Lined Pipe or Tin Lined Copper Pipe up to the location of the meter.

All meter locations to be approved by said representative before water is turned on.

Meter Rates and Service Charges

Meters shall be installed on all domestic use services by the District at a fixed rate of meter rental per year as follows:

Size	Rental Per Year
⅝ inch	$1.00
¾x1 inch	1.50
1 inch	2.00
1½ inch	4.00

Close Up of Hydrant

Meter rentals to be charged upon first bill rendered each year.

The accuracy of the meter on any premises will be tested by the Department upon written request of the owner, who shall pay in advance a fee of one dollar to cover the cost of the test. If on such test the meter shall be found to register over 3 per cent more water than actually passes through it, the meter will be repaired, and the fee of one dollar will be repaid to the consumer and the water bill will be adjusted in accordance with the result of the test.

Meter Rates

Minimum charge—$24.00 per year, which entitles the owner to 40,000 gallons per calendar year. The owner will be charged for water used in any one calendar year in excess of 40,000 gallons and less than 100,000 gallons at the rate of 40c per thousand gallons, and for all water used each calendar year in excess of 100,000 gallons and less than 500,000 gallons at the rate of 25c per thousand gallons and for all water used each calendar year in excess of 500,000 gallons at the rate of 20c per thousand gallons.

A charge of $1.00 will be made for turning off the water and a charge of $1.00 will be made for turning on the water each time the Water Department is requested to do so by the owner or occupant.

Absence or vacancies within the year will not relieve the owner from the payment of water bills rendered to cover the annual charges.

Year Around Consumers

The annual minimum charge of $24.00 to be billed proportionately each quarter, January, April, July, and October, to year around consumers together with any excess use over that provided for in the minimum use of 40,000 gallons, should that occur within the year.

Summer Properties

Commencing January 1, 1940, water consumption on such services will be billed upon the basis of the minimum rate charge for the year of $24.00, each year, due and payable in 15 days and must be paid before July 1st each year, otherwise services will be discontinued at that time and remain off until settlement of the account is made.

It will be the rule to remove meters without cost to property owners, from the premises of all summer properties on or about October 1st of each year, unless advance notice is given that it is the desire to have it remain on for a longer period at owners risk to damage from freezing.

Where there is not a daily flow of water consumption during the winter period and meter boxes have been installed, it will be required that such boxes be packed with mineral wool or such other non-freezing material as may be necessary to prevent damage where it is desired to have the water left on throughout the year.

All meters located in cellar or other location on summer property that are not removed from the premises before November 20th each year, are retained by property owners at their risk.

Responsibility

Owners of premises will be held responsible for water consumption at rates prescribed. No collections will be made from tenants.

The Board reserves the right at any time to turn off the water should property owners become delinquent in payment of any amount due, with a charge of $2.00 in addition, before the water is turned on again.

Acknowledgment

The writer would like to express his appreciation of the assistance in the preparation of this paper which was rendered by our genial Clerk of the Board and Manager, Mr. Samuel D. Amen.

GOOD AND BAD PRACTICES IN TANK MAINTENANCE*

By WALKER B. DAVIS
Counsel
CHICAGO BRIDGE & IRON COMPANY
CHICAGO

A lawyer appearing before a group of engineers to talk about good and bad practices in maintenance of elevated tanks owes such an audience an explanation, particularly if he has never spent even a summer vacation working on a water tank. I may as well confess at the outset that I have no first-hand knowledge of tank maintenance, and not very much second-hand knowledge, so that I have had to borrow liberally from the writings and speeches of members of our company's operating department in order to have anything at all to say about the good practices in this field. The reason I am here is that in the course of my legal activities I have learned something about some very bad practices from which the owners of elevated tanks have suffered and I have been discussing with the officers of this Association ways and means of discouraging these practices.

Everyone knows, of course, that steel will rust if it is not painted, and I am sure it is generally appreciated that an elevated steel water tank should be cleaned and painted periodically. There are many reputable companies and individuals who do this work and do it well. A few unscrupulous concerns, however, have made contracts for cleaning and painting tanks an excuse for doing a great deal of unnecessary work which they call "repairs" and for which a considerable number of municipalities have paid many times what it would have cost to have their tanks cleaned and painted by honest contractors. These concerns have extended their activities into almost every section of this country. Their energy, their skill as salesmen—and, I may add, their ability in court—is really amazing. Indeed, it would seem that they could earn an honest living with much less effort, and certainly with much less risk, but apparently it is more fun to operate a racket.

The Rivet Racket

Cleaning and painting a tank is merely incidental as far as these racketeers are concerned. It serves as a convenient starting point for their real objective. They take a

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cleaning and painting contract at a low figure, but they slip in a clause which permits them to replace loose and defective rivets, and to weld pits, at so much per hour, or so much per rivet, or on some other basis which makes it profitable for them to replace as many rivets and weld as many pits as possible. Once they get such a contract, they do a minimum of cleaning and painting, and concentrate their efforts on cutting out rivets as fast as they can. When they have cut out so many rivets that the tank is completely unserviceable, they sometimes demand a written order to replace the rivets they have cut out, and they tell the municipal authorities that if they do not get such an order they will go away and leave the tank as it is. This threat, of course, is an effective one, because if it is carried out the town will be without water until someone else can be found to put the tank back into service.

The village of Dexter, near Ann Arbor, Michigan, has an elevated water tank that was built about 1927. In 1940 a tank repair company persuaded the village authorities to enter into such a contract as I have described. The painting was done without adequate cleaning of the steel, so that less than a year later it was possible to remove large pieces of paint with one's fingers, and there was a good deal of rust on the inside of the pieces that were removed. There were about 4,275 rivets in the shell and bottom of the tank. It seems hard to believe but actually 4,198 of these rivets were cut out and replaced—in other words, all but 77 of the rivets in those parts of the tank on which any work was done. The village received a bill for about $4,300 covering over 1,700 man hours of extra work which was done under the supposed authority of the clause authorizing the replacement of defective rivets, etc. The village had already paid $1,300 before the fraud was discovered, but refused to pay the balance, and the tank company brought a suit to enforce payment. The case was tried in the Circuit Court at Ann Arbor. The evidence disclosed that an inexperienced foreman had been put in charge of the work and that, as the trial judge said, the service was less than valueless—it actually damaged the tank. Fortunately, the trial resulted in a decision in favor of the village, but the village was put to a great deal of unnecessary expense, and the village officials were greatly inconvenienced, even though the contested bill did not have to be paid.

Things like this have happened in a number of other towns in various parts of the country. There is a lawsuit pending now in which the town of Illmo, Missouri, is seeking to recover damages because a large number of sound rivets were cut out of its tank and the town had to get someone else to restore the tank to working order after these depredations had been committed. The town of Enfield, North Carolina, had a somewhat similar experience. The State of Michigan had to defend itself in the Court of Claims against a large bill for the removal and replacement of rivets that were not defective. And so the list might be continued. If the public officials discover that they have been imposed upon before they have paid the bill, they can defend themselves in court, but that is not a very satisfactory remedy, as a lawyer must be the first to admit. The real solution, of course, is prevention and I know of no way to prevent such occurrences except to familiarize municipal authorities and water works engineers with the facts and keep repeating them almost incessantly, so that the things one group of officials has

*A paper presented by the author at the Wartime Conference of the Am. Water Works Association in Chicago, Ill., the reproduction of which has been authorized by the Association.

learned will not be lost sight of when their successors take office.

Characteristics of Rivets That Should Be Better Understood

I assume most of you know that rivets in elevated water tanks are quite commonly driven with flat heads on the inside of the tank. These flat heads have rough, irregular surfaces, and after they get a little rusty, it is easy for an unscrupulous person to lead municipal officials, and others inexperienced, to believe that the driven head on the inside of the tank was originally round and smooth, like the manufactured head on the outside, and that most of the inside head has rusted away. Actually, of course, the amount of steel lost by rusting is insignificant and the rivet head is practically as good as it ever was. Some of my colleagues have compared the weight of rivets driven experimentally with the weight of rivets which one of these repair companies had cut out as defective and have found that there was very little difference. In the Dexter case, witnesses testified that the hammer marks which were made when the rivets were originally driven could still be seen on some of the heads that had been cut out of the tank.

Even if the inside rivet head has largely rusted away, the rivet does not need to be replaced, as long as it stays in its hole and does not leak. While the rivet head may be for the purpose of water-tightness, it is the shank of the rivet that carries the shearing stresses. The important point to remember is that if the tank does not leak the rivets are not defective, and there is no occasion to replace them until leaks definitely develop. Even then remedies other than replacement are available and effective.

Occasionally small leaks develop around rivets where the steel of the rivet head is not in contact with the steel of the tank plates. Except in unusual cases, where corrosion is very severe, such a leak can easily be stopped by the use of ordinary hand caulking tools. It is not necessary to replace the rivet and the chances are that anyone who wants to replace it either doesn't know his business, or knows it too well, and wants to take advantage of the municipal officials with whom he is dealing. In either case, he is not the sort of person who should be allowed to do any work on an elevated tank.

Plate Pits and Correctives

If a tank has been neglected, the steel plates may become pitted because of rust, and in extreme cases the rust may have eaten completely through the plate, leaving a hole through which water can escape. Such a condition can be temporarily corrected by inserting a patch bolt which will close the hole and will often suffice for several years. Welding of pits and leaks is of doubtful value, because the heat which is generated in the process of welding often causes new leaks, and even if a considerable area is welded, other leaks are apt to appear relatively soon. In ordinary cases, where the pits are not serious, the best procedure is to clean them and repaint them without attempting to fill them. The only complete remedy in serious cases, of course, is the replacement of the plates which are involved and that should be done only by someone who is thoroughly competent to do it.

Spider Rods Deceive

Another source of income to unscrupulous tank repair companies is the replacement of spider rods. While a tank is being erected these rods are placed across the top of the tank shell under the roof, like the spokes of a wheel, but they are really nothing more than pieces of erection equipment. They have no permanent value to the tank. Spider rods rust out rather rapidly, because they are alternately under water and above it, and consequently they can be pointed out to the uninitiated as horrible examples of the things the rust is doing to a tank. They look enough like structural elements to convince many people that they are necessary to the stability of the tank, whereas in fact they are of no importance once the tank has been built, and there is no occasion whatever to replace them if they rust out. The suggestion that the spider rods need to be replaced ought to be a danger signal and ought to lead municipal officials to avoid any dealings with the man who makes it.

Another favorite scheme of the racketeers is to convince the owner of an elevated tank that the sway rods are in need of adjustment and that the tank is likely to collapse if they are not tightened before the wind starts to blow. This is very definitely a false alarm. We have never heard of a case where adjustment of sway rods was necessary to prevent a tank from collapsing. The rods are carefully adjusted when the tank is built, so as to distribute stresses uniformly throughout the tower, and ordinarily the original adjustment is sufficient. If any subsequent adjustment is needed, the work should be done by an expert or else the original balance will be disturbed and serious distortion may result. The itinerant tank fixer is not very likely to be competent to do that sort of work.

One of the tricks of these outfits is to change the names under which they operate after the news spreads that one or two towns have been defrauded. I know of one man who operated for a while under one firm name, then went to work for his wife, who operated under a different firm name, and finally had his own name legally changed and began to operate from new headquarters under still a different firm name.

Longevity of Water Tanks

If an elevated water tank is thoroughly cleaned and painted with reasonable frequency it should have a very long life. A recent survey of 111 tanks and standpipes along the New England seacoast, where weather conditions are most unfavorable and waters are corrosive, showed that 67 tanks were still in use, and that their average age was already 47 years. Only 12 standpipes had become unsafe after 35 to 40 years. The other 32 no longer in service had been superseded by elevated tanks or had become inadequate to meet increasing demands for water. It is very unlikely that even a tank which is 30 years old will need extensive repair, unless it has been very badly neglected, and if it has been neglected, the neglect will be evidenced by leaks if the consequences have been at all serious.

Remedies for Weeping Tanks

If a tank does develop leaks, the remedy is usually simple and inexpensive. The safest thing to do in such a case is to notify the company which built the tank and ask for an inspection. The builder will be glad to inspect the tank for a nominal charge and will tell the owner what is necessary to put the tank in good condition. Ordinarily the builder will not be interested in cleaning or painting the tank but I am sure that any company which builds tanks has enough interest in the tanks it has built to be willing to make an inspection and advise the owner what is needed to return it to first class condition. If something goes wrong with an automobile, you go back to the man who sold it to you, and the same practice is advisable in the case of a water tank.

Need for Standard Specifications Covering Cleaning and Painting

When the activities of unscrupulous tank repair companies were brought to the attention of the

American Water Works Association, the Board of Directors wisely concluded that it would not be sufficient merely to issue a warning, but that something constructive was required in addition to the warning. It was decided that standard specifications for cleaning and painting elevated tanks and standpipes should be prepared and furnished to municipalities, so that it would not be necessary for the municipal officials to rely for specifications on those who solicit maintenance work. Mr. Ralph Green, of our company, has drafted some specifications which I believe the A.W.W.A. Board of Directors is considering amongst others. I am not going to present these specifications at length because they are tentative and the scope of the final specifications has not yet been determined. However, since President Howson has suggested that I comment on them, they will be summarized briefly.

The inside of a tank is actually more apt to be damaged by rust than the outside. Before the paint is applied, all dirt, rust, loose mill scale and loose paint should be removed by means of scrapers and wire brushes so that the surface of the steel will be clean and smooth. If the condition of the steel is such that scrapers and wire brushes will not clean it properly, it should be sand-blasted, using chiefly silica grains as sharp and coarse as practicable. *No greater area should be sand-blasted on any one day than can be painted on the same day.* Whether the steel is cleaned with scraper and wire brushes or by sand-blasting, all rust which forms on the cleaned surface should be removed before any paint is applied.

If the old paint is in fair condition, only one new coat may be necessary, but if the steel is exposed in spots, these spots should be given a patch coat before the finish coat is applied. If the surface is in bad condition, there should be a primer coat and a finish coat, and in any event the amount of painting to be done and the number of coats should be carefully specified.

Opinions will differ, of course, about what kind of paint to use. Naturally, a good quality of paint made by a reliable manufacturer should be specified, and price should definitely not be the controlling factor in making the selection.

The cathodic method of protecting the inside of a tank against rust is a recent development which, I believe, eliminates the necessity of painting in some circumstances, but unfortunately I am not familiar enough with this method to discuss it and I mention it merely in order that it not be overlooked.

The specification should, of course, require a workmanlike job and it is advisable to include a provision that each coat must be allowed to dry thoroughly before the next coat is applied and that paint shall not be applied during wet or foggy weather or when the temperature of the air is below 50° Fahrenheit. I think we all know that weather conditions must be reasonably favorable in order to get satisfactory results in painting.

Frequency of Renovation and Selection of Contractor

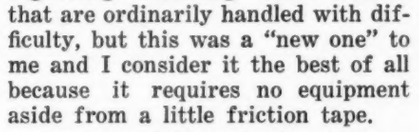
If an elevated tank is thoroughly cleaned and painted at least once every four or five years, it is not likely to require much other maintenance and it is not likely to need repairs. Rust is the principal enemy of such tanks and its ravages can be checked by periodic cleaning and painting. If, however, repairs do become necessary, they should not be done as an incident to a painting contract. The tank should be inspected by the builder or some other competent party, the exact repairs that are necessary should be determined and one or more proposals for doing that particular work should be obtained. The work should be let only to a qualified, experienced concern of recognized standing which is known to the municipal authorities and which can give satisfactory references. Before signing a contract with a concern which is not well known to be reliable the references which are given should be checked, because the unscrupulous repair companies are both ingenious and daring, and they may not hesitate to name as references people who they know will not recommend them should an actual inquiry be made. I know of one case where our own company was given as a reference by a man who I am sure knew that we had a good deal of unfavorable information about him and that we would not hesitate to give this information if we were consulted.

Even in ordinary times, an elevated tank is an asset which should be protected and made to serve a community for many years. At present, when the use of steel for elevated tanks is severely restricted, it is more important than ever to see that existing tanks are well cared for. I am sure you will agree with me that it is a serious crime to waste steel by removing rivets that are still serviceable. I hope that you will cooperate with this Association and with the various Municipal Leagues and Better Business Bureaus in exposing the rackets I have described and giving public officials the facts as to what is necessary for the maintenance of elevated tanks and what is not only unnecessary but positively harmful.

If you know of any cases where municipalities have been imposed on, and if you are in a position to substantiate the facts, I am sure the American Water Works Association would like to hear from you. If you have or can obtain any evidence of violation of State or Federal law, I think you will be doing a public service by turning over such evidence to the proper authorities, so that they can prosecute the offenders and check the racket. I shall be glad personally to do anything in my power to assist anyone who can and will take action to put an end to such practices.

[In connection with the tank renovation racket it was interestingly brought out in the discussion following Mr. Davis' paper that these racketeering firms had become known to municipal authorities through paid ads appearing in the official Municipal League magazines —such ads being taken to indicate the dependability of the firms offering the renovation service through such official publications.—Ed.]

How to Insert One of Those Troublesome Small Screws



Here is a valuable kink that was shown to me the other day by one of the ablest mechanics I have ever known. He gave me permission to tell about it and to draw this sketch. I thought I knew most of the kinks regarding inserting small screws that are ordinarily handled with difficulty, but this was a "new one" to me and I consider it the best of all because it requires no equipment aside from a little friction tape.

It is exceedingly simple. Place a bit of friction tape around the tip of the screw driver, as indicated in the sketch, so that there will be a snug fit—sufficiently tight to hold the screw on the end of the screw driver. Then go ahead and insert the screw. That's all there is to it. Try it and you, too, will use this method.

(Contributed by W. F. Schaphorst, M. E., Newark, N. J.)

CALIFORNIA SEWAGE WORKS ASSN. MEETS IN LOS ANGELES

A Report by
A. M. RAWN
(Associate Editor)
Chief Engr. and Gen'l Manager
SANITATION DISTRICTS OF LOS ANGELES COUNTY
LOS ANGELES

CONSPICUOUS were the number of Army Cantonment sewage treatment plant operators, amongst the one hundred members of C.S.W.A. who gathered at Los Angeles, California, September 20, 21 and 22 to confer on the usual and some of the unusual problems which the national emergency presents in sewerage. Registration, which began at 5:00 p. m., Sunday afternoon, was followed by the Operators' Round Table Dinner at 8 p. m. Sixty-five operators and engineers attended this session, which continued on until 11 p. m. Much of the time at this conference was consumed with the discussion of sludge heating, digestion, and allied pursuits.

Inspection Tour

On Monday morning the technical session was concluded at 11:30 A. M. for the trip of inspection. The caravan proceeded to Long Beach, to view a new sewage pumping station—one of a couple of dozen in that city—and therefrom to the Pacific Coast Club at Long Beach, as the City's

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guests, for luncheon. In the afternoon the Los Angeles City Terminal Island treatment plant was visited under military escort. The next point of "debarkation" was the Joint Disposal plant of the Los Angeles County Sanitation Districts; and finally to view the sewer ventilation station installed by Los Angeles City on its North Hyperion Outfall near the sea.

The Monday evening dinner guest speaker, Dr. Elmer Belt, President of the California State Board of Health, described the Department's activities in health and welfare work in California, and their relationship to the state's citizenry.

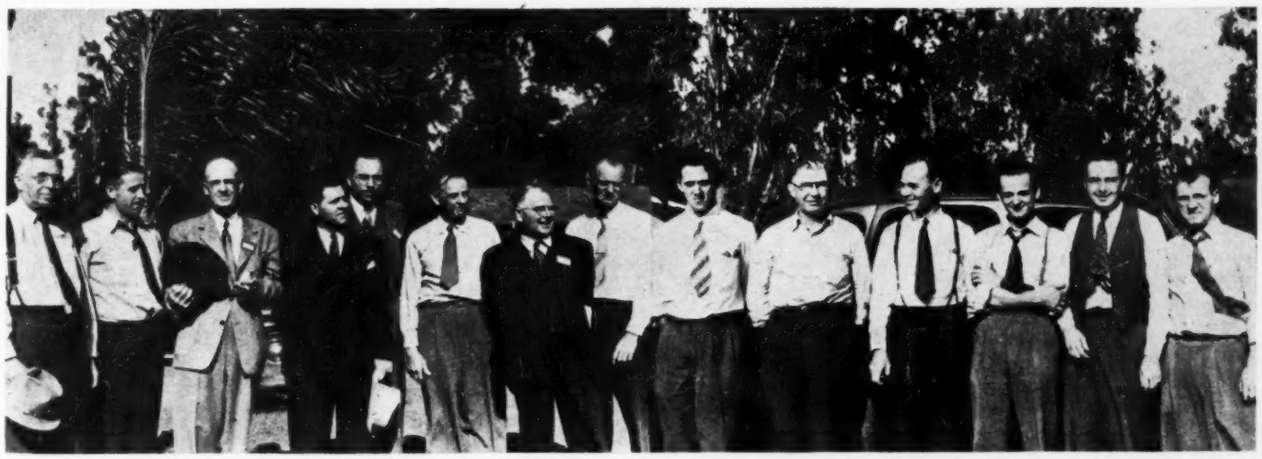
This meeting of the Association was the annual conference held concurrently with that of the League of California Cities as one of its allied but not member institutions.

Hoskinson New President

The Tuesday afternoon business meeting concluded with the election of Carl M. Hoskinson, Chief Engineer, Division of Water and Sewers, Sacramento, as President. Jack H. Kimball, Sanitary Engineer, Orange County Health Department, Santa Ana, was re-elected Secretary-Treasurer.

"Shore Pollution Reduction at San Francisco"—by Charles Gilman Hyde, Consulting Sanitary Engineer, Department of Public Health, San Francisco.

Professor Hyde described conditions which existed along the shores and shore waters of the Pacific



A. T. Wintersgill, Vice-President, Pacific Clay Products, Los Angeles
W. M. Knapton, McClellan Field
D. R. Kennedy, Superintendent, Pipe Line Division, Long Beach
Judson A. Harmon, Assistant Sanitary Engineer, and
Edward A. Reinke, Senior Sanitary Engineer, California State Dept. of Public Health
Fred D. Bowlus, Construction Engineer, Los Angeles Co. Sanitation Districts*
John McBride, City Engineer, Santa Ana
*Jack H. Kimball,** Sanitary Engineer, Orange Co. Health Dept.*

**President of the Association*
***Secretary of the Association*

Charles Baugh, Chemist, Los Angeles Co. Sanitation Districts
L. R. Wright, Joint Disposal Plant Superintendent, Los Angeles Co. Sanitation Districts

W. T. Bush, Sewage Plant Operator, Camp Cook, Calif.
Harvey Ludwig, Albany, Calif.

A. Martin Berlin, Engineer, American Crystal Sugar Co., Clarksburg, Calif.

Vinton Bacon, Assistant Engineer, Los Angeles Co. Sanitation Districts

Norris Bostwick, Engineer, U.S.E.D.
W. S. Tanner, Engineer, U.S.E.D.
J. R. Elliott, Associate Engineer, U.S.E.D.
R. E. Ramseier, Div. Sanitary Engr., U.S.E.D.
H. W. Jorgensen, Assoc. Engr, U.S.E.D.

Wm. J. O'Connell, Jr., Wallace & Tiernan Co., San Francisco
Geo. W. LaSage, Sanitary Engineering Dept., City of Los Angeles
Victor J. Borland, Assistant Engineer, Los Angeles County Sanitation Districts
C. R. Compton, Assistant Chief Engineer, Los Angeles County Sanitation Districts

Ocean Strand in San Francisco. Although improvements to the shore waters were not restricted solely to that area by construction of the Marine Pumping Station and the Richmond-Sunset Treatment Plant, bacterial sampling of the shore waters in 1940-41-42 has been confined thereto, and comparative data for those waters are most readily available. The population now sewering that location is approximately 164,000—not including transients and important suburban groups. Prior to improved sewage disposal average presumptive B. coli per c.c. ranged from 9.6 at Funston Life Guard Station to 128.8 at Balboa Street. Following improvements similar analyses indicated an average of 8.1 at the former and 10.3 average at the latter. Discussing the bacteriological findings, Professor Hyde stated: "One of the outstanding disclosures of that investigation was that the pollution of the Pacific Ocean shore water, as indicated by the numbers of B. coli therein, was progressively greater according to the proximity of the Mile Rock sewer outfall." This statement related to conditions existing prior to San Francisco's sewerage improvements. After the improvements tests indicated a uniformly clean water throughout the entire length without reference to the outfall itself.

In Professor Hyde's absence, his paper was presented by your reporter.

"Orange County Joint Outfall and Sewage Treatment Plant"—by J. L. McBride, City Engineer, Santa Ana, Calif.

The speaker first indicated the legal structure of the Orange County joint sewerage undertaking. He stated that it was not a District, and only derived its legal entity from contracts executed with all of the cities and sanitary districts participating for use of the joint collection and disposal facilities. All corporations participating administer their own systems, with jurisdiction of the Outfall Treatment Authority terminating at each point of junction with the outfall system. Sulphuric acid attack upon non-resistant structures has been the great "bug-bear" of the Orange County joint enterprise. Mr. McBride traced the undertaking from its inception in 1922; its subsequent partial destruction by gas attack and collapse in 1927, and later in 1938 by flood waters of the Santa Ana River, to its repair and replacement, accompanied by installations of the plain subsidence works at Santa Ana. The latter is now being modified to serve adjacent military establishments. He also described the acid protective outfall from the treatment plant to the ocean at the mouth of the Santa Ana River, from which point a 42-inch ocean pipe line discharges the settled sewage 4,000 feet off shore.

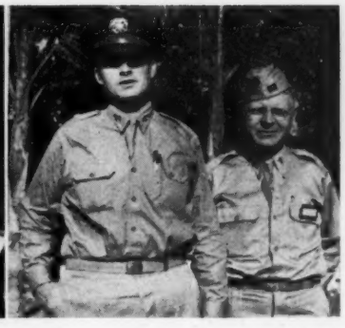
The speaker's remarks were supplemented by those from E. P. Hapgood, City Engineer of Anaheim, and Grover L. Walters of the Water and Sewer Department of Fullerton. These two men discussed the wastes from fruit and vegetable canneries. The discharge from which is greater this year than in previous seasons because of the accelerated rate of production for the nation and its armed forces. The gist of their remarks was to indicate quantity of wastes discharged, and to corroborate McBride's remarks regarding their effect upon the joint treatment facilities situated at Santa Ana and under the management of that municipality.

"Characteristics and Treatment of Potato Dehydration Wastes"—by Harold Farnsworth Gray; and Harvey W. Ludwig, the latter a graduate student in Engineering, University of California, Berkeley.

Mr. Ludwig presented the paper in Mr. Gray's absence. A flow sheet for the potato dehydration plant showed the processing of the vegetables from washing—through peeling—trimming—cutting—secondary washing — blanching—dehydration —tray scraping—sifting and inspection—to canning, sealing, labeling and crating of the boxes. The bulk of wastes come from the peeler and secondary washing. Peeler wastes from a 30-ton plant amounted to 17,300 gallons per day, from which a material portion of the solids are removed by short period plain subsidence and disposed of as garbage. The secondary wash waste amounts to 69,000 gallons per day—all of which is discharged to infiltration beds. The peeler and potato washing wastes, after the garbage has been removed therefrom, are discharged onto percolation beds at the rate of 60 gallons per minute during the dehydrating season. One of eight beds—each 20x160 ft.—is used each day in rotation. The speaker related that most of the coarse solids settled out on the bed in ten minutes. Substantially all of the starch sludge material was precipitated within 60 feet of the inlet end of the beds. Sufficient water had been removed at the expiration of one and one-half days to permit shoveling the dried residue into carts; however, beds were allowed to dry three days, after which the moisture remaining in the sludge approximated only twenty per cent. This was removed and the bed again prepared for its

Mrs. Harold H. Jeffrey, Sacramento
Miss A. H. Blair, Rec. Secy., Los Angeles
Mrs. Carl M. Hoskinson, Sacramento

Alfred Jones, County Engr. and Surveyor,
C. E. Arnold, Chief Deputy County Engr.,
Los Angeles County



Capt. William T. Ingram, U. S. Public Health Service
Capt. R. H. Luebbers, U. S. Sanitary Corps, San Luis Obispo, Calif.

AVERAGE CHARACTERISTICS POTATO DEHYDRATION WASTES	Abrasive Peeler Wastes	Spray Washing Wastes
QUANTITY OF FLOW		
Gallons per ton (of potatoes dehydrated)	600	2,500
B. O. D. (5-day, 20°C.)		
Parts per million (approx.)	6,000	1,000
Lb. per ton per % loss in peelers	2.0	....
Lb. per ton	30*	20
% removed by screening (60 mesh)	20*	....
% removed by 10-minutes settling	30*	Little
% soluble B. O. D.	40*	50*
SUSPENDED SOLIDS		
Parts per million (approx.)	30,000	1,500
Lb. per ton per % loss in peelers	10	....
Lb. per ton	150	30
% removed by screening (60 mesh)	30	....
% removed by 10-minutes settling	X	Little
SETTLEABLE SOLIDS (2 hrs.)		
Milliliters per liter (approx.)	285	12
Cublic feet per ton per % loss in peelers	1.5	....
Cubic feet per ton	23	4
% removed by screening (60 mesh)	80	....
% removed by 10-minutes settling	90	Little
pH (approx.)	6.5	6.9
Oxygen consumed		
Parts per million (approx.)	1.5x BOD	9,000

Notes

10 min. settling means 10-min. settling in 1000 ml. graduate
X means not yet determined
*assumed 15% abrasive peeling loss (this represents best practice)

turn in effluent disposal. Following are some of the factors indicated:

"Ventilation of Large Sewers by City of Los Angeles"—by H. G. Smith, Engineer of Sewer Design and Plant Operation, Los Angeles, Calif.

Mr. Smith presented the text of his discussion which was illustrated by slides, described in their order of appearance by R. F. Brown, Operation and Maintenance Superintendent from the Los Angeles City Engineering Department.

The City of Los Angeles has been working for a number of years upon the problem of ventilation of sewers as a means of protecting the interior against the destructive attacks of oxidized hydrogen sulphide. Work commenced on this feature in a section of the North Outfall tunnel near the ocean and has proceeded to where there are now three ventilating stations on the system. It is proposed that eight stations will be constructed as and when all of the difficulties of operation are ironed out. Gases are exhausted from the sewer and discharged through high stacks (40 to 60 ft.). The stack is equipped with a silencer comprising an inner screen eighteen (18) inches in diameter and ten (10) feet long, cylindrical in shape, which restrains between it and the shell of an outer pipe, a packing of expanded silica called Vermiculite. In order to eliminate odors the gases are passed through a fine spray of chlorinated water. The spray carries several thousand parts per million of chlorine in the form of hypo-chlorite and completely absorbs or destroys the odors generated by hydrogen sulphide and other sulph-hydrates and the nauseating mercaptains. The recirculated solution is regenerated and supplemented as required.

In response to a question, Mr. Smith stated that the protection of the interior of the sewers by this means was much cheaper for the extremely high flows of septic sewage coursing through the city's lengthy trunks and numerous branches than chlorination of the sewage to inhibit bacterial action would be. Since the City of Los Angeles does not treat the sewage by bacterial or oxidizing processes at its treatment works, septic sewage at that location is of no consequence.

"Protection of Sewage Works in War Time" — Discussion led by Captain William T. Ingram, Assistant Sanitary Engineer, U. S. Public Health Service.

Captain Ingram posed the following basic questions for consideration:

(a) Was there a complete and detailed map of the entire system available for use in event repairs became necessary?

(b) Had sufficient thought been given to the illogical behavior of the civilian population in time of great stress?

(c) Had the possibilities of sabotage been sufficiently explored?

Captain Ingram suggested that each operator and manager view his sewerage system as though he himself were to be the saboteur, and then proceed to formulate plans for thwarting such possibility with himself charged with operation and maintenance.

(d) Would stream pollution become a factor if the system were badly disrupted or the treatment works destroyed?

(e) Were those employed, and those to be used as relief and supplemental personnel, being given sufficient training and education so that they could operate under the stress of war conditions?

(f) Were the administrative or-

ganizations manned and staffed with individuals who were not only thoroughly familiar with the systems themselves, but with precautionary measures to be taken to prevent sabotage and the prosecution of steps essential in the repair of structures which had been bombed?

(g) Finally, Ingram suggested that by-passes be provided where essential, and that the operators be sufficiently aware of the possibilities of using gutters or flumes in transporting sewage around or over bombed areas.

Following his presentation of the topics which he believed were worthy of discussion, Captain Ingram called upon representative engineers and operators from over the state to contribute to what was being done throughout the area to fulfill the requirements of adequate operation and maintenance during the troubles which he had described. Comments were varied and numerous, but indicated that in the larger cities there appeared to be coordinated plans looking to the repair of sewers, pumping stations and treatment works, all well adjusted to other civilian defense activities. In smaller cities, particularly those not near the metropolitan areas, plans are insufficient and considerable work remains to be done.

This discussion concluded the Conference.

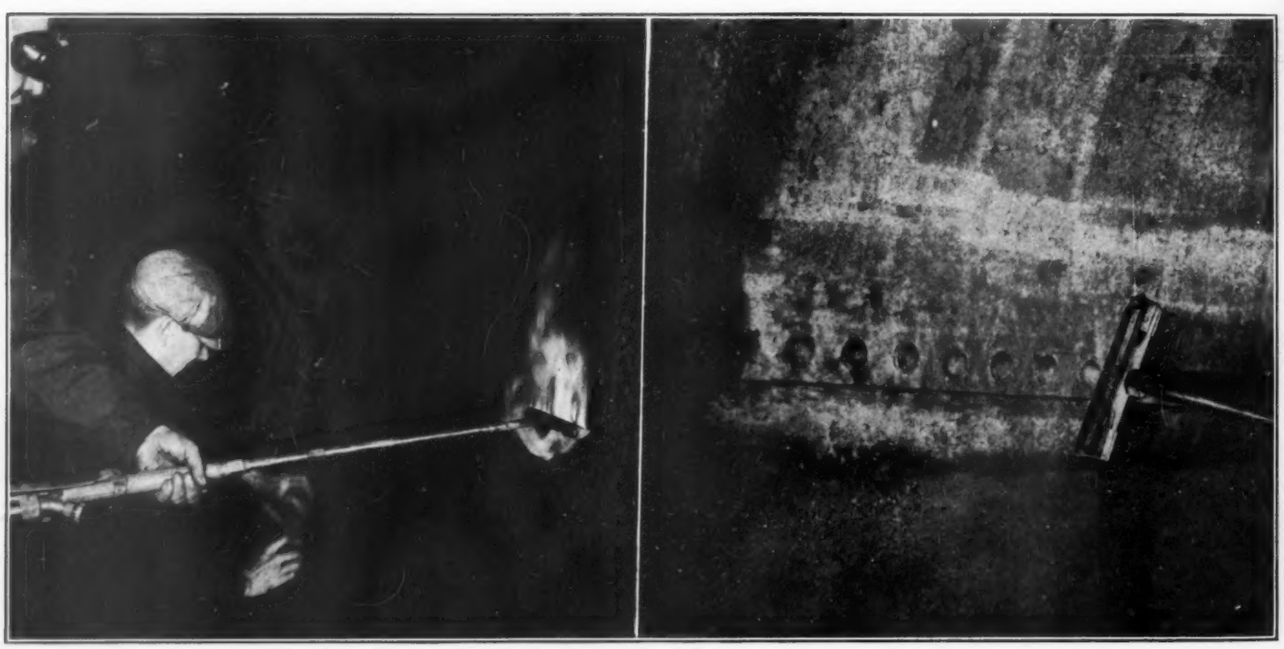
"FLAME-PRIMING"

As a Method of Removing Rust, Scale and Tubercles From Pipe Interiors, Tank Walls, Etc.

It is a well-known fact that heat applied to the interior of rusted or tuberculated iron or steel pipes dehydrates the hydrous iron oxide and renders it easy to dislodge rust, scale and tubercules when cleaning the inside of pipes in preparation for their lining with cement or bituminous coatings. As a matter of fact tubercules often drop away from the walls of cast-iron pipes which have dried out thoroughly in the sun.

The accompanying pictures reveal a speedy method of dehydration of corroded or tuberculated tank or pipe interiors. Instead of the slower blow-torch method, a wide head oxy-acetylene blow pipe is employed. The intensely hot high velocity oxy-acetylene flame makes short work of the dehydrating job. After this flame treatment the granulated rust and scale is readily removed with a wire brush. Much of it (plus scale and tubercules) pops off during the flaming and drops to the floor of the pipe, tank, etc. This method of surface preparation leaves the walls clean, dry and warm, thus making the protective coating go on faster, bind tighter and last longer in consequence.

One of the accompanying pictures reveals how effective the oxy-acetylent blow-pipe head is in removing corrosion products from around rivet heads. The Linde Air Products Co., who supplied the photographs, explain the reason for the effect as being due to the "blasting" action of the high-velocity high-temperature flame jets from the number of closely spaced flame parts.



"Flame-Priming"

Note how effective the oxy-acetylene blow-pipe has been in cleaning around rivet heads, seam, etc.—usually the toughest part of a cleaning operation.

Proven Simplified Process

★ ★ ★ ★

NON-CRITICAL MATERIALS
MINIMUM MECHANICAL EQUIPMENT

THESE ARE THE FEATURES OF "CHICAGO" WAR TIME SEWAGE PLANTS

★
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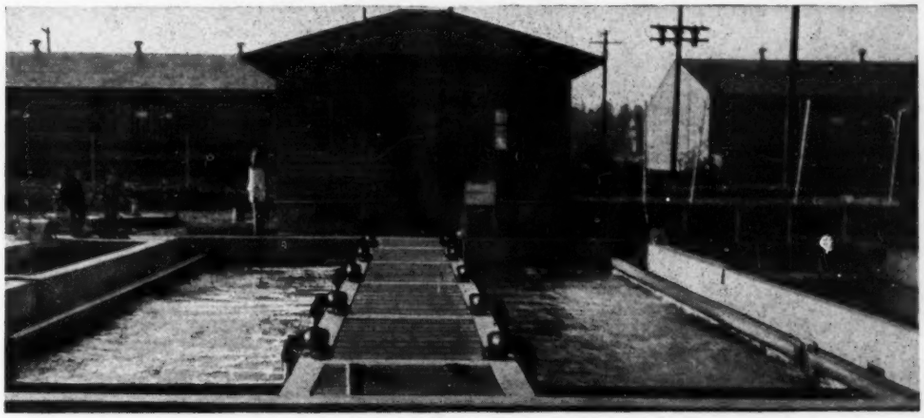

Typical "Chicago" War Time Sewage Plant with wooden structures.

THE CALL TO ARMS for critical materials finds us ready with a proven simplified sewage treatment process and equipment of thoroughly reliable non-critical materials that have actually proved capable of practical and satisfactory performance.

READY NOW, because our Development Engineers for the last 10 years have been working toward a simplified process with less mechanical equipment made of economic materials.

FOR HIGH DEGREE OF TREATMENT small "Package" type Activated Sludge Plants with the Combination Aerator-Clarifier for populations up to 3000 are constructed almost entirely of wood. This was perfected years ago for timber regions.

FOR PURIFICATION UP TO 85%, a process on which we have been working for some years has been adapted to plants of extremely simple design. They require less critical materials, the least amount of mechanical equipment for volume handled and are more economical than other types of plants for comparable treatment.

WAR TIME ADVANTAGES of "Chicago"-equipped and processed sewage plants include:

- **Less Shipping Space Required**
- **Shorter Time for Installation**
- **Less Labor for Installation**

Specify "Chicago"-equipped and processed plants of simplified design with non-critical materials and minimum mechanical equipment. Take advantage of our Engineering data, application information and operation experience.

144
SUCCESSFUL "CHICAGO" EQUIPPED ACTIVATED SLUDGE PLANTS SINCE 1936
Prove the Efficiency of the Process with Rationally Applied "CHICAGO" Equipment and Operator Training Service

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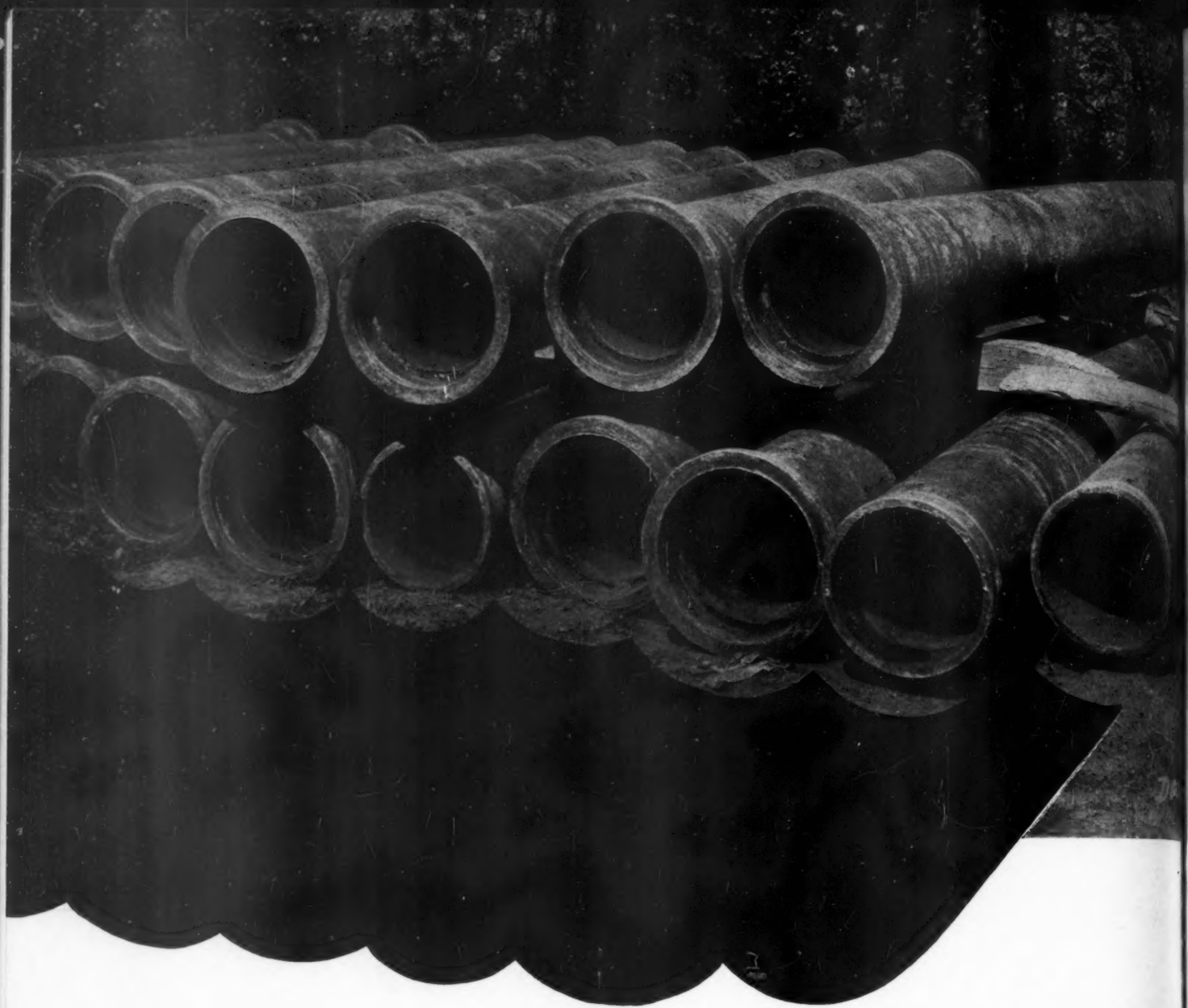
FIRE — HOUSE — SEWAGE — SCRU-PELLER PUMPS
AERATORS — COMMINUTORS — SAMPLERS

REPRESENTATIVES THROUGHOUT THE UNITED STATES AND FOREIGN COUNTRIES



CAST IRON MAINS, when abandoned or re-routed, can be salvaged and re-used, thus saving money for the taxpayer. For example, the 16-inch cast iron pipe shown above had served the City of Roanoke, Virginia, for 50 years in its original location. Last year it was removed to make way for a new armory and relaid in a new location to serve out its full life of more than a century.

We have on file many records of old cast iron mains which have been taken up and re-used, or sold to other cities for re-use, or sold as scrap. It is impossible to foretell future requirements or population shifts in metropolitan cities but any public official can be sure that, when water or sewer mains must be abandoned or re-routed, the pipe can be salvaged or re-used, if it is cast iron pipe.

Pipe bearing this mark is cast iron pipe

TRADE MARK REG.

Available in diameters from 1¼ to 84 inches.

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CAST IRON PIPE

Sto
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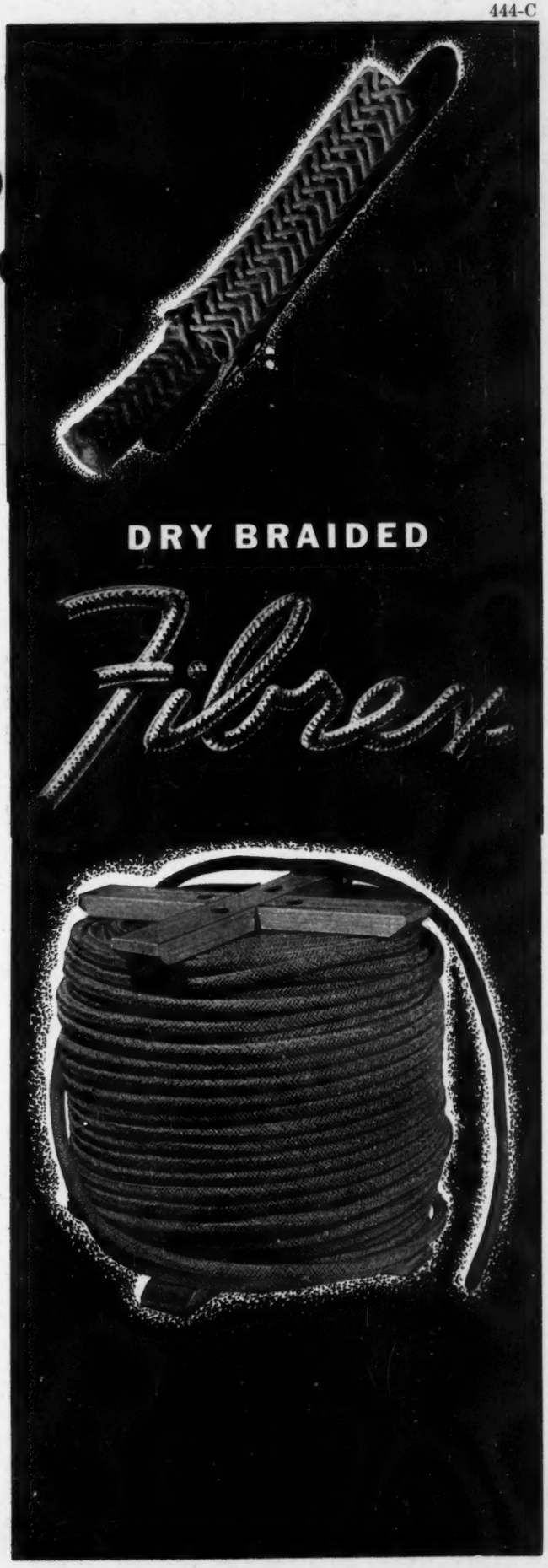

A *Sanitary* Packing—Used in Jointing Bell and Spigot Pipe for Water, Sewer Mains and Soil Pipe.

USED LIKE BRAIDED JUTE WILL NOT BREED BACTERIA

FIBREX is a paper packing treated with a special water repellent which keeps it sterile and prevents its disintegration. It has a hard twisted core with a basket weave covering. Fibrex packs in a joint exactly the same as braided jute.

FIBREX is put up in 35 and 60 pound reels. It is priced slightly higher than braided jute but is much less expensive as 70 pounds of Fibrex will go as far as 100 pounds of jute.

FIBREX is being used with Hydro-Tite and other self-caulking compounds, with lead, Sani-Tite and other asphalt sewer joint compounds. Thousands of pounds of Fibrex are in service in both water and sewer joints throughout the country.

See page 96 for the complete story on Hydro-Tite—the dependable self-caulking compound.

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Main Sales Office: 50 CHURCH STREET, New York, N. Y.
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"THE ENLARGED MUNICIPAL FILTER PLANT"
Rocky Mount, N. C.
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Wm. Muirhead Construction Co.,
General Contractors
Durham, N. C.

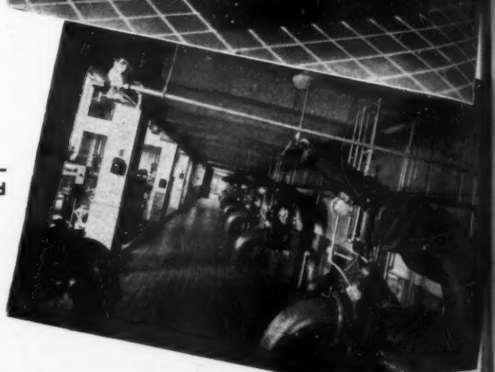
THE Municipal Filter Plant at Rocky Mount, N. C., has been enlarged to 6,750,000 gallons daily capacity. The plant now embodies nine Filters, each having an area of 270 square feet. In this enlarged and modernized installation, North Carolina scores again with one of the most attractive and most efficient Filter Plants in the United States.

The four original Filters at Rocky Mount were the first in the State to be equipped with the Wheeler False Filter Bottom. Now, after more than seven years of continuous service, we are informed by the City that the sand beds are as clean as when first installed; no replacement, even of top sand, has ever been necessary; never have mud balls accumulated; and at no time has need been apparent for auxiliary washing facilities. The Filters are backwashed at a rate of only fifteen gallons per square foot per minute; the washing time does not exceed five minutes; runs are upward of sixty hours; and average wash water consumption is little more than one per cent of the plant capacity.

Reports such as this continue to prove our claim that the Wheeler False Filter Bottom is "The Perfect Underdrainage System".

"THE OPERATING FLOOR."

"THE LATEST ROBERTS OPERATING TABLE—Type P with Electric Indicators —no cords—no pulleys."



"THE PIPE GALLERY—note the very compact and effective layout."

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TEACHING PLANT OPERATION TO SANITARY ENGINEERS

Some Views of an Operator Who Makes a Pretext at Teaching

By GEORGE E. SYMONS*
Chief Chemist
BUFFALO SEWER AUTHORITY
BUFFALO, N. Y.

IN PRESENTING a discussion on this subject, it may be presupposed that the author either has some novel idea which will be of benefit to educators, or that he proposes to point out some lack in existing curricula. In short, the author may say, "Here is an idea worthy of consideration," or he may pose and answer the question, "What is wrong with the teaching of Sanitary Engineering?" If one chooses the former attack, he may become so enthused with his own brain-child as to completely ignore the necessary correlation of any new idea to the existing system. If one chooses to offer criticism, however constructive, he may become enmeshed in lively controversy. Perhaps some course charted between this Scylla and Charybdis may bring us to the sea of wider vision. In steering a course between these two, it is the intent of this paper to look at both in passing and to do so from an operator's point of view—primarily.

Sanitary Engineering covers a broad field, including control of air, water, milk and other foods; control of liquid and solid wastes, and of animal and insect carriers of infection; and other activities. This discussion, however, shall be limited to the subject of water purification, and sewage treatment, with particular reference to plant operation in both cases. The teaching of these foundations of the science of sanitation has been of considerable interest within recent years.

This interest is evidenced in the recent reports[1] of the Committee for the Advancement of Sanitary Engineering of the Division of Sanitary Engineering of the Amer. Soc. of Civil Engrs.; it is also evidenced in various papers listed at the end of this discussion under "References." A recent one by Arthur B. Morrill[3] was an excerpt of an address on "Vocational Guidance and Sanitary Engineering In-

The Author

struction," presented last year before the Sanitary Engineering Conference of the Society for the Promotion of Engineering Education.

This writer also appeared on that same program with Mr. Morrill and discussed the subject of sanitary engineering instruction and sanitary works operation.[4] The first part of that address presented some possible answers to the question, "What is wrong with sanitary engineering?" and inferred that some criticism could be directed at the teaching of sanitary engineering as related to plant operation.

Regarding the general theory of teaching, it was brought out in that address that portions of the A.S.C.E. Committee Report[1] indicate that the education of sanitary engineers varies among institutions. The report stated that there exists "lack of uniformity of curricula" and that the suggestion of a generally applicable schedule is impractical. The report suggested that the undergraduate course must be extended beyond four years; or, for the necessary sanitary engineering training, we must look to one or more years of post graduate study which would follow a four year course of basic engineering and cultural subjects.

In discussing the progress report in January, 1941, Prof. Gordon M. Fair (Harvard University) indicated that he favored graduate instruction in a few institutions, since consulting engineers and governmental agencies have been satisfied with men available from civil engineering curricula that have established *sanitary options* with courses in bacteriology, chemistry, water supply and sewerage. He further stated that this has generally prevented the wider expansion of teaching activities in this field, and that in his opinion, "the field of sanitary engineering is an extremely broad one with room for many types of engineers, chemists, and bacteriologists, and that we should not adopt a dog-in-the-manger attitude but should welcome into the profession all the varied talents that it really requires."

Somewhat opposed to graduate study after a conventional Civil Engineering course, Prof. Thomas R. Camp, of Massachusetts Institute of Technology, presented the ideas of the Committee of the M.I.T. Alumni on Sanitary Engineering Education[2] — namely that undergraduate training of sanitary engineers should include more "time and study of basic chemistry and biology" than offered in the conventional civil engineering curriculum. In other words, Prof. Camp believes a special four year course in *Sanitary Engineering* is better, not only for four year graduates, but also for those who desire post graduate study to become better qualified for work in the field.

Concerning the Teaching of Plant Operation

The following discussion is offered in an endeavor to present some ideas with particular reference to teaching plant operation. There are reasons why we should teach sanitary engineers something about operation. The A.S.C.E. Committee suggests that "the services of engineers in water and sewage works are becoming more and more essential to satisfactory operation" and, "it is essential that the training include facilities for the demonstration of the application of bacteriology and chemistry to the processes concerned, and instruc-

*Lecturer in Public Health Engineering, University of Buffalo.

tions in the engineering aspects, principles of design, and the operation of equipment. . . ." It is also important to ground men in plant operation if they are to compete with "experience" in locating operating and supervisory positions.

As to the amount of attention that should be apportioned to the study of sanitary works' operations, one might be guided by the proportion of sanitary engineers who actually engage in operation. A cursory examination of the list of living graduates from courses in Sanitary Engineering at Massachusetts Institute of Technology has been made. Of slightly more than 400 living graduates in 50 years, approximately 35 per cent are now in Sanitary Engineering. These are distributed through consulting engineering staffs, departments of health, educational institutions, sales engineering and operation. Only approximately 15 per cent of those now practicing in sanitary engineering are employed in the management or operation of water supply or sewage disposal.

Prof. Babbitt[5] has stated very succinctly one reason why more engineers have not entered the field of operation, as follows: "Political affiliations are all too often placed over merit and a local resident, however incompetent, is too often preferred above a well-trained but imported recruit whose addition to the community would be a valuable asset."

Another reason for the failure of engineers to utilize their professional training in the operation of sanitary works is that generally the remuneration for such positions is relatively low compared with other lines of endeavor. This may be because both water and sewage plants are usually located at some distance from the heart of the political body governing their operation, and are apt to be quite forgotten as regards budget requirements and qualified personnel. Another reason is the general disinterest of the public in water and sewage treatment and the lack of professional solidarity and definition of sanitary engineering.

The question is — should much effort be made to give instructions concerned with operation if it is to benefit so few? The answer is, Yes —because it will without question benefit more than those few. It will benefit all who are concerned with sanitary engineering. Furthermore, there has been a large increase in the number of water and sewage plants in the past several years and the tendency in sewage plants has been toward a higher degree of mechanization. Both of these factors indicate a need for more trained men essential to satisfactory operation and an absorption of more trained sanitary engineers into the field of operation. Is it not also reasonable to assume that if more young sanitary engineering graduates are equipped the per cent going into operation will be considerably above the records of the past.

Some Specific Reasons

Some specfic reasons for presenting problems of operation to sanitary engineering students may be cited before any concrete suggestions are made as to teaching. Perhaps one of the best reasons is the criticism so often voiced by operators—that designing engineers are not familiar with the problems of operation and, hence, details of design often result in operating difficulties. This thought was recognized by the Department of Public Health of Illinois which devoted a section in "The Digester"[6] to operators' suggestions to designing engineers. The topic has also been discussed at various meetings—"Operation vs. Design."

A further reason is to develop in the embryo sanitary engineer a sixth sense or "feel" of operation which cannot be learned from the text book or the laboratory. He should learn that there are problems that arise which often must be answered before he has time to look up his lecture notes to find that they probably do not contain the answer. He must learn that water plant operators live by the creed, "It's got to go," and that stoppage for any reason is not countenanced. He must learn that in a sewage treatment plant problems that arise may require immediate action, not after the holiday. He should know something of the practical methods of the older operators who learned in the school of "experience."

These problems may be mere details but the engineer can answer them, much sooner and better, if he has learned beforehand that plant operation is not always according to the text books. There are times when some mere detail may cause an interruption to a public utility which is vital to the life and operation of a community. It is not essential that such detailed items be covered in a course, but certainly the student should have first-hand knowledge of the equipment, of the problems of operating it, of the possibilities for catastrophes to occur, and practical solutions that have been applied in the past.

As a specific thought, the author concurs with the A.S.C.E. Committee suggestion that the sanitary engineer should have more than the minimum of prescribed courses in English, Journalism and Public Speaking. For the engineer to be adequately equipped, there should be a course in the curriculum designed specifically for the preparation of reports, on public speaking and general rhetoric, as well as an effort toward developing managerial ability if the "spark" is there.

Operators of water and sewage plants should be capable of answering complaints as to tastes and odors, either by written or spoken word, and should be able to properly present and defend their reasoning for requesting new equipment or increased budgets. The operator will find it to his advantage to appear before organizations and groups and speak, not necessarily with flowng rhetoric, but certainly with such logic, consistency, clarity and a freedom from grammatical error and inuendo that he is convincing. He should be capable of writing a report or an article worthy of publication in recognized technical journals.

As a second suggestion; the internecene warfare between departments as to which shall undertake the presentation of a particular course should be eliminated in all institutions. Prof. Babbitt's story[8] of the economics department which desired to encompass the course entitled "Economics of Concrete Beams" and the reply by the Civil Engineering Department that by the same token it should teach the "Foundations of Christianity" may be overdrawn somewhat, but it certainly indicates a tendency that exists in many institutions. It can not be expected that the sanitary or the civil engineering course can teach economics, bacteriology, chemistry, botany, zoology, microscopy, or other subjects that are necessary to the curricula for no other reason than that the equipment is not available in that department. But this should not prevent that particular department from making an effort to cooperate with the engineering department to present the subject in question to fit the needs of the sanitary engineering student. Where facilities are available, providing the teaching personnel is adequately grounded in the subject, there is no reason

why sanitary chemistry and biology should not be offered in the engineering curricula. The main objective to be sought is that the student receive as adequate instruction as possible in the course and that the instruction be given by a person thoroughly trained and conversant with the subject.

The Importance of Operator-Lecturers

As a third suggestion; here the author is again in accord with Prof. Babbitt[5] that it would be advantageous to student sanitary engineers to receive training through lectures given by operators who may be trained graduates with experience and knowledge of some particular problem of operation and the curriculum budget should provide a sum of money to pay the expenses of such operator-lecturers. Such an idea would serve to give contact between the student and the field of operation.

Prof. Fair[7] has suggested a laboratory course in sewage treatment to "acquaint the students tangibly with the most important scientific principles that underlie the performance of sanitary works." Prof. Fair believes that such a course in parallel with classroom instruction in theory will make the concepts of sewage fundamentally real, "freed, as it were, from the sheath of empiricism that so often envelopes them in practice."

While the author agrees with this course in laboratory instruction in theory and principle, he believes that some of this "empiricism" should be shown to the student. Certainly he should learn that although any one or several of these principles are at work in a plant, they may be completely obscured by other factors and conditions which, while controllable in the laboratory, cannot be controlled in the field.

The Advantages from Field Observations

To impart some of these empirical relationships and factors, and as a fourth idea, field trips are suggested as a means of acquainting students with problems of operation. All too frequently field trips are limited either to one local water and sewage plant or are skipped entirely because there is not sufficient time to make them. Chemical engineering students in most institutions take extensive field trips as a course during the spring vacation, traveling by bus or other means to large manufacturing plants that best exemplify the processes about which they have studied. Sanitary Engineering could do no less. In this same category of field trips should be included a recommendation that students become junior or affiliate members of operators' organizations concerned with water and sewage treatment. Attendance of the student at sectional meetings of these organizations will allow him to become better acquainted with operators' problems.

Summer Work at Plants

Since we learn by doing things, a fifth suggestion is that "shop courses" in water purification and sewage treatment be considered. Experimental plants, not too small, as now exist at the New York University, offer fine possibilities of acquainting the student with actual operating problems. It is also suggested here that a "summer camp" idea, as used for training young civil engineers in surveying, be utilized as a further means of teaching operation of sanitary works to students. For this training the student would actually work in a plant for six weeks or so, and thus become acquainted with the mechanical and chemical processes necessary to maintain the plant in proper operation, always under the watchful eye of the regular operator.

It is quite probable that, if these suggestions are followed and other desirable courses are added, the curriculum will have to be lengthened beyond the present four-year program. A five-year curriculum has been discussed for some time and has recently been added at Purdue University.[9] Such action may presage similar extension in other universities.

It is also suggested that where chemists are needed in the larger water or sewage plants, particularly for other chemical studies besides the usual routine water and sewage analyses, chemistry students should elect options in sanitary engineering in the senior year and, if possible undertake at least a year of graduate study in sanitary engineering.

Whether sanitary chemistry and biology are placed in the sanitary engineering division, as far as administration is concerned, is of little importance so long as the student receives the proper approach to the subject and has it definitely correlated to his engineering studies.

Having been an operator by birth, a chemist and bacteriologist by training, and an engineer by adoption, the author believes the curriculum should embody all three elements. Perhaps this suggestion lies somewhere between the viewpoints of Prof. Camp and Prof. Fair.

In Summary

In brief summary; from the standpoint of operation, it is believed that more than a civil engineering course followed by a year of graduate study and more than a normal one year sanitary option in civil engineering is necessary for a Sanitary Engineer's education. Certainly it is agreed with the A.S.C.E. Committee that "that broader training — to include generally more chemistry, biology, sanitation and economics be encouraged . . ." This broader training should include a special course in English and journalism and some attempt to bring the student into closer contact with operation of sanitary works by lectures by operators, field trips, and operation practice in what may be termed "shop courses."

A student thus grounded, not only in engineering but in these other phases of his science, will be prepared for design with the proper concept of operation; for efficiency of actual operation of sanitary works; and for the broader field of graduate study and teaching. Thus will the Sanitary Engineer successfully take his challenging place in the field of public health and the general activities of his community.

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THE N. J. SEWAGE WORKS ASSOCIATION AT PLAY

AS at the three earlier Annual Summer Outings members of the New Jersey Sewage Works Association took out a day for play, recreation (and horse-play) on Saturday, September 26th, when the Fourth Annual Summer Outing of N.J.S.W.A. was staged at Doerr's Grove, near Springfield, N. J.

More than 100 members and guests came early and stayed late. An innovation this year was the presence of many of the members' "better-halves" who enjoyed the "show" perhaps even more than did the members themselves. The interesting and diversified series of "events" concluded with the featured five innings of softball, consisting of "Peddlers vs. Operators." An excellent mid-day dinner was served by the Grove's chef and that foamy amber fluid was plentiful all day.

The Events

The "events" scheduled by the committee were designed more to provide entertainment than to prove the skill of the contestants. The following came out the "winnahs":

"Art" Bell of Essex Fells proved to be the "champ" at "Throwing-the-Bull." The big "muskle" man proved to be George Thurling of Hackensack, who won the contest of "Putting-the-Shot" with a toy balloon as the shot. And the ladies were not wholly left on the side lines, either, for Mrs. Rochford proved to be a double "winnah" when she took first prize in the "Rolling Pin Throw" and repeated as winner also in the more legitimate "Basket Ball Throw." Mrs. Molitor won the "Balloon Race"; Mrs. Schwarz the "Shoe Race"; Mrs. Bobac the "Potato Race." Lon Nemecsek and "Tubby" Thurling were the winning team in the "Three-Legged Race."

J. Radell proved himself a real "champ" by showing his ability and skill with the horseshoes. Moving through the eliminations, the final contest was between Radell and Lou Fontenelli—a couple of *real* shoe pitchers. The prize captured by Radell was a pair of tickets to the professional football game between the N. Y. Giants and the Phila. Eagles.

"Peddlers vs. Operators"

The first contest between "Peddlers and Operators" went to the "Sludge Shovellers" without much opposition. When the "Peddlers" took one look down the line of "beef" on the Operators' end of the "tug of war" rope they "settled" without straining ligaments needed for the featured event of the day which was to follow.

The big and closing event was the five inning softball game. With Manville's "Mickey" Kachorsky at the helm for the Operators and "Captain Charlie" McClosky of Penn Salt directing the "Peddlers" the game was on. Stika for the "Peddlers" and Euthwhistle for the "Sludge Shovellers" were the opposing moundsmen. Jack Albertson starred in the field for the Peddlers—only seven errors out of eight tries was his record. For the "Peddlers" Stika and Thurling provided the punch with consecutive home runs in the third inning, which eventually brought the 11-9 defeat for the Operators. "Art" Bell, with three hits for three official times at bat and a classy brand of fielding around first base, was the star for the Operators. Lou Fontenelli and Anderson also showed well at the plate for the loosers.

Johns Manville's Lou Frazza and the Association's ex-President, Ed. Molitor, in the role of the "singing waiters" acted as official custodians and purveyors of liquid refreshments throughout the big game.

W&T's "Cy" Tygert, the Association's official cameraman, knocked himself out getting action shots of the game, but when revived provided an interesting half hour's entertainment by showing "movies" of the Association's previous outings.

The Outing Committee, consisting of L. Frazza, C. Tygert, H. Vandervliet, Ed. Molitor and John Horgan, deserve thanks for the "big time had by all" at the Fourth Annual Summer Outing—and of which there will be more to come.

Those Attending the Fourth Annual Outing of the N. J. Sewage Wk's Ass'n.

A PNEUMATIC GRIT WASHER AND EJECTOR

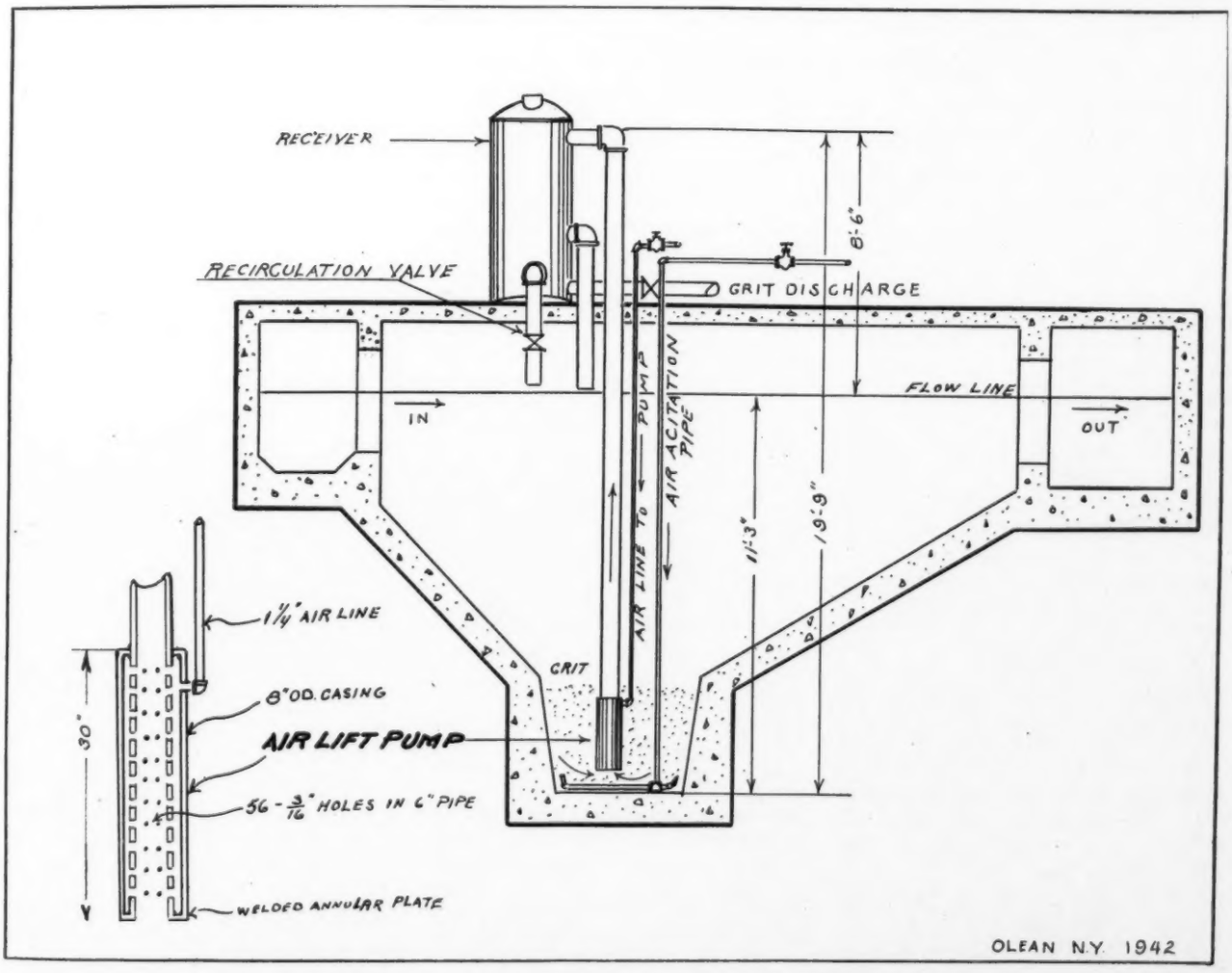
By NELSON M. FULLER
Superintendent
Water Works and Sewerage
OLEAN, N. Y.

THE removal of grit at the Olean Sewage Treatment Plant is a very important detail of plant operation. Large quantities are received from storm drainage and from railroad repair shops. Also large amounts of sewage solids settle out in the grit chamber. Former methods of removal by hand, chain hoist and truck followed by burial were very disagreeable, being akin to cleaning out a large privy each week.

Formerly six man-days were required to carry out this operation, whereas the air lift system now in use washes the grit and disposes of it in thirty minutes. A mechanical conveyor system proposed for the removal of the grit would have cost $5,000. Using scrap materials and our own welders the air-lift pumping equipment herein described cost under $100.

The Author

The air-lift system was limited in design to the use of air from our own portable air compressor of 105 cubic foot capacity. This permitted the use of a six inch flow pipe. An air lift pump is simple to construct after the correct size pipe is found which will give a uniform flow with-



Details of the Olean Pneumatic Grit Washer and Ejector

out "blowing through." The air water mixture must have a velocity upwards of ten feet per second. The foot-piece (the air and water mixing device) was designed so that in this case no obstruction to the free flow of grit, small sticks, and the rags which sometimes pass the bar screen could get fouled at the entrance.

Foot Piece of Special Design

The sketch accompanying this description shows a detail of the foot piece, which was made by boring fifty-six three-sixteenth holes in a thirty inch section of six inch pipe. This section of pipe was then placed into a piece of eight inch pipe and welded at both ends. The one and one-quarter inch air line was connected into the eight inch casing. A small tank was picked up as junk and was used for the air and water separator or receiver.

It will be observed from the sketch that the grit discharge line from the receiver can be closed and that

View of the Receiving Chamber and Separator — Olean Pneumatic Recirculating Grit Washer

the grit and solids can be recirculated to secure any desired period of washing action in the grit chamber proper. After a suitable period of washing the grit is allowed to settle and the sewage solids which are then in suspension in the grit chamber are flowed into the settling tanks. When this is completed the washed grit is removed by the air lift pump and discharged to the point of final disposal, which in our case is the Allegany River.

In order to clean out the corners of our grit chamber and to hold sewage solids in suspension air jets have been arranged to agitate the grit in these areas.

While the adaptation of air-lift in washing and pumping grit was at the time believed to be original with us, upon looking up the subject in the literature we have found an excellent paper in Sewage Tanks Journal, Volume V, No. 3, pages 509-522. The author is H. Blunk, Engineer, The Emscher Genossenschaft, Essen, Germany, and the title of his paper is "A Contribution to the Design of Grit Chambers," translated by G. P. Edwards of New York.

The author wishes to acknowledge the material assistance rendered in the development of the Olean Grit Washer and Remover by Alfred Mann and Bruce Strong, operators at the Olean Sewage Treatment Plant.

SAFE COLUMNS FROM STANDARD PIPES

By W. F. SCHAPHORST, M.E.
NEWARK, N. J.

Ordinary pipes often come in handy for use as columns or struts or for use as "push members" in transmitting forces. Due to its circular form, pipe is ideal.

However, when it comes to "figuring columns," it usually takes considerable time digging around in handbooks, etc., and as a result the use of a pipe is avoided. Or, a pipe much too large or too small is used, chosen entirely by "guess." The pipe that is too small may fail and be the cause of disaster.

Those who may have occasion to use standard pipes in this way will find the following simple table and rules of value:

1. Knowing the load that is to be carried and the length of pipe needed, make a "guess" as to the size of pipe. Column A in the tables will help in making the guess as it gives the maximum length of pipe that may be used. Thus, never use a ⅛-in. pipe, as an important column, longer than 14.5 in. Never use a 3-in. pipe, as an important column, longer than 139 in., etc.

2. Multiply the length of the pipe in inches by the corresponding figure in column B of the table. This product should never be greater than 12,000. If it is greater than 12,000 it means that you have guessed a pipe that is too small. After getting the right size, proceed as follows:

3. Subtract the product from 19,000. If the difference is equal to or less than 13,000 use it, in (4). If the difference is more than 13,000 use 13,000 in (4).

4. Multiply by the figure in column C, corresponding with the pipe size.

The result is the number of pounds that the pipe will carry as a column, strut, or "push member." If the result is less than the load to be carried, try again, using the next larger pipe size, and so on until the proper and most economical size is selected.

Size of Pipes, Inches	Column A Maximum Length, Inches	Column B	Column C
⅛	14.5	826.4	0.07
¼	19.4	617.3	0.12
⅜	25	480.8	0.17
½	31.3	383.1	0.25
¾	40	300.3	0.33
1	50.6	237.5	0.50
1¼	64.7	185.5	0.67
1½	75	160.5	0.80
2	94.7	126.9	1.07
2½	114	105.3	1.71
3	139	86.21	2.24
3½	161	74.63	2.68
4	181	66.23	3.18
4½	202	59.52	3.68
5	226	53.19	4.32

Example: It is desired to support a load of 10,000 lb. at a height of 84 ins. What size of pipe should be used? Following the rules, we do this:

1. "Guessings" the size of pipe, column A, shows that 84 ins. falls between 1½ and 2-in. pipe. We will therefore try a 2-in. pipe.

2. $84 \times 126.9 = 10{,}650$. This is less than 13,000 and we may therefore use it in (4). If the difference were 18,350, we would have to use 13,000 in (4).

3. $19{,}000 - 10{,}650 = 8{,}350$. This is less than 13,000 and we may therefore use it in (4). If the difference were 18,350, we would have to use 13,000 in (4).

4. $8{,}350 \times 1.07 = 8{,}950$ lb.

Since 8,950 lb. is less than 10,000 lb. a 2-in. pipe is too small. We will therefore recalculate, this time trying a 2½-in. pipe.

2. $84 \times 105.3 = 8.850$.
3. $19{,}000 - 8{,}850 = 10{,}150$.
4. $10{,}150 \times 1.71 = 17{,}370$ lb.

This shows that a 2½-in. pipe would be amply safe to hold up 10,000 lb. It shows that a 2½-in. pipe is capable of holding the load safely.

WATER AND SEWAGE PATENTS

(Of Recent Issue)
Reported by
JULIAN F. SMITH*
CENTRAL COLLEGE
FAYETTE, MO.

WATER PATENTS

Proportioning Device. Apparatus for feeding a liquid reagent to water passing through a main has a casing which communicates with the main through a bottom orifice and through a by-pass pipe from the top of the casing, and a series of cups mounted on a shaft in the casing. Andrew J. Chesson, U. S. 2,284,618, June 2.

Water Softening. A coagulant for softening and clarifying water contains bentonite and an alkali metal aluminate. F. K. Lindsay and J. W. Ryznar (to National Aluminate Corp.) U. S. 2,284,827, June 2.

Algicide. Preventing growth of algae in swimming pools, water cooling towers, spray condensers and the like by immersing copper naphthenate in the water. G. M. Fisher (to Socony-Vacuum Oil Co.). U. S. 2,284,889, June 2.

Water Main Lock. A tool for insertion in water mains has upper and lower locking members on the two arms of a yoke. Rudolph Specht. U. S. 2,285,099, June 2.

Ion Exchange. An ion exchange reagent for purifying water is water-soluble but is insolubilized by fixation with an aminotriazine-aldehyde resin. R. C. Swain (to American Cyanamid Co.). U. S. 2,285,750, June 9.

Clarifying Water. A composition for clarifying muddy water comprises finely powdered soft coal and reagents including ferric sulphate, sodium silicate and sodium phosphate. R. R. Magill (to Peabody Coal Co.). U. S. 2,285,992, June 9.

Base Exchange. Passing one stream of water through a hydrogen exchange zeolite and another stream through a base exchange material, and joining the streams, the volume of the second stream being adjusted according to the pH of the mixed effluent. A. S. Behrman (to Infilco, Inc.). U. S. 2,287,284, June 23.

Silicic Acid Removal. Freeing water from silicic acid by treatment with magnesium aluminates at a pH between 7 and 9. Hellmuth Reichelt and Hans Zirngibl. U. S. 2,287,486, June 23.

Increasing Water Flow. E. D. Every (to Artesian Well and Equipment Co.). U. S. 2,288,233, June 30. Apparatus for increasing the flow of water in artesian wells, including an inner casing with a bottom section open at the top but closed at the bottom.

Liquid Feed. G. M. Booth (to Wallace and Tiernan Co., Inc.) U. S. 2,289,332, July 14. A proportioning device for feeding reagent to a liquid has a hydraulically operated pressure chamber with passages for receiving and discharging liquid.

Controlling Composition. C. F. Wallace (to Wallace and Tiernan Co. Inc.). U. S. 2,289,610-1, July 14. Electrolytic apparatus for detecting changes in the composition of a liquid such as water, one or both electrodes being a liquid metal.

Boiler Water Alkalinity. R. M. Buist and M. F. Parker (Parker assignor to Buist). U. S. 2,291,146, July 28. Maintaining constant alkalinity in boiler water under all temperature conditions by adding an aqueous solution of 7% sodium carbonate, 5% trisodium phosphate and 3% sodium tetraborate.

Polar Adsorbents. Eric B. Higgins. U. S. 2,291,226, July 28. Making a cation exchange agent from petroleum acid sludge and sulphuric acid.

Clarifying Water. Carl A. Carring. U. S. 2,292,742, Aug. 11. A plant for coagulating impurities in water and settling the coagulum has superimposed sedimentation chambers with connecting pipes, and compressed air means for flushing sediment from the bottom.

Water Softener. K. Slidell (to Research Products Corp.). U. S. 2,292,801, Aug. 11. A water softener tank has a brine feed device and an automatically controlled system for flushing spent brine from the tank.

Water Purification. O. M. Urbain and W. R. Stemen (to Chas. H. Lewis). U. S. 2,294,764-5, Sept 1. Purifying water by base exchange in contact with an alkali metal zeolite made from powdered coal, molten ferric chloride and an alkali metal compound or an acid.

Flocculation Apparatus. B. J. Clark (to Permutit Co.). U. S. 2,295,714, Sept. 15. Apparatus for continuous flocculation has a flocculation chamber with water and reagent inlets at one end, an outlet to a settling chamber at the other end, and an improved agitator with parallel disks for directing flow.

Flow Control. W. H. Green (to Infilco Inc.). U. S. 2,296,247, Sept. 22. The flow system of a filter includes a perforated underdrain connected to a pipe having a valve for flow control.

Water Purifier. W. H. Green (to Infilco, Inc.). U. S. 2,296,437, Sept. 22. Apparatus for purifying water includes a tank, a mixing chamber receiving reagent and water through separate inlets, a launder for treated water at the top of the tank, and means for adjusting the flow of water and reagent.

Treating Water. W. H. Hinsch (to Dearborn Chemical Co.). U. S. 2,296,713, Sept. 22. The reagent feed to a water treatment tank is controlled by an electrically operated valve the circuit for which is opened or closed according to the water level in the tank.

Preventing Boiler Embrittlement. W. C. Schroeder and A. A. Berk (to the Government of the United States of America as represented by the Secretary of the Interior). U. S. 2,297,670, Sept. 29. Protecting boiler metal from embrittlement by adding a phlobotannin to the boiler water.

*Associate Director, Hooker Scientific Library.

SEWAGE PATENTS

Grease Retainer. Apparatus for separating oil, fat and grease from waste waters in continuous flow by dividing the water stream into zones, in one of which flow is turbulent, while in the other it is quiescent. Jos. Hirshstein (to Ruth Newman and Mildred Hirshstein). U. S. 2,284,737, June 2.

Sewage Clarifier. In sewage purification apparatus an aeration tank leads to a clarifier tank in which a baffle is interposed between the inlet and the outlet, and effluent from the clarifier can be returned to the aeration tank. Augustus C. Durbin, III. U. S. 2,285,697, June 9.

Sewer Trap. A trap for insertion in sewers has a valve seat and a closure normally held to the valve heat by a spring. Peter J. Schweighart. U. S. 2,285,756, June 9.

Drying Sludge. A furnace for drying sewage sludge with heat from burning refuse has enclosed drying hearths one above another. R. W. Rowen (to Nicholas Engineering and Research Corp.). U. S. 2,286,309, June 16.

Treating Sludge. In settling apparatus for separating suspended solids from liquids a sludge impeller is provided which is controlled according to the load against which it operates. R. G. A. Weiss and H. J. Talbot (to Dorr Co.). U. S. 2,286,397, June 16.

Sewage Disposal. Raw sewage is treated in a primary and a secondary settling tank, with means for aerating the sewage twice between the settling tanks. C. G. Hawley (to Hawley Engineering Corp.). U. S. 2,287,427, June 23.

Purifying Oil-Contaminated Waters. Ralph A. Stevenson. U. S. 2,288,330, June 30. Water contaminated with crude oil or petroleum refinery wastes is aerated to reduce the oil content, then chlorinated to stabilize the water against bacterial action and hydrogen sulphide production from sulphur compounds in the oil.

Sewer Cleaner. Robert F. Therrien (one-half to Henry A. Luelf). U. S. 2,287,916, June 30. A cutting head for cleaning clogged sewers has a nose, a rotary follower and a coupling with a splined connection providing telescopic means between nose and follower.

Sewer Cleaner.. Clarence E. Babcock. U. S. 2,288,771, July 7. A cutting head for sewer cleaners has a supporting base and an elongated blade supported from one end at the base.

Clarification. A J. Fischer (to Dorr Co.). U. S. 2,289,112, July 7. Combined flocculation and sedimentation apparatus having an upright intermediate boundary wall and a flocculation zone at least partly surrounded by a sedimentation zone.

Controlling Sewage Flow. John F. Murphy (to Albert P. McCulloch). U. S. 2,290,246, July 21. Apparatus for controlling sewage has an oscillating valve connected to a rock shaft for intake control, and a partition with adjustable gate in the receiving chamber to control flow.

Sludge Remover. R. B. Plummer (to Jeffrey Mfg. Co.). U. S. 2,291,103, July 28. A sludge collector has a movable flight in the path of which a wiper, yieldable under pressure of obstructions, is mounted to wipe sludge from the flight.

Sewage Sluiceway. S. L. Tolman (to Jeffrey Mfg. Co.). U. S. 2,291,121, July 28. An inclined screen is mounted in a sewage sluiceway and a baffle, its level controlled by a float, is extended across the sluiceway slightly above its bottom.

Settling Sewage. A. W. Lemmon (to Jeffery Mfg. Co.). U. S. 2,291,641, Aug. 4. Conveyors with horizontal drive shaft and spaced flights are immersed in the sewage in settling tanks, the ends of the flights being close to the side walls which divide the tank into compartments.

Burning Sludge. T. R. Komline (one-half to John R. Downes). U. S. 2,292,571, Aug. 11. Feeding dried sludge and solid fuel to a mixer and then to the ignition nozzle of a burner.

Sewer Cleaner. Andrew A. O'Leary. U. S. 2,292,713, Aug. 11. A cutter head for sewer cleaners has a pair of resilient strips, each with a central flat clamping portion and a toothed portion.

Treating Sludge. A. J. Fischer (to Dorr Co., Inc.). U. S. 2,293,028, Aug. 18. Multiple stage treatment of sewage sludge in elutriating tanks, arranged in series, with the treatment cycle scheduled so that all or part of the intervals between sludge discharge periods is utilized in cyclic treatment and elutriation of the sludges in individual tanks.

Clarifier. John J. Seip. U. S. 2,294,697, Sept. 1. Apparatus for removing suspended solids from a liquid by suspending additional solids in the liquid till a specified turbidity is reached, and filtering through a sludge bed.

Sewage Treatment. Augustus C. Durdin, Jr. U. S. 2,295,391, Sept. 8. Agitating and aerating sewage in a tank in which the propeller automatically stops at a specified load and automatically starts again after a predetermined rest period.

Biological Purification. Rene A. Henry. U. S. 2,296,523, Sept. 22. Purifying sewage, drainage liquors and other wastes or their slimes by suspending clay in lime water, adding the clay to the waste liquor and allowing biological purification to proceed along with the resulting adsorption processes.

Alkaline Sludge. Karl Behringer (title vested in the Alien Property Custodian). U. S. 2,297,195, Sept. 29. Rendering sewage sludge putrefactible by neutralizing the lime with carbon dioxide, thereby reducing the alkalinity of the sludge.

MINNESOTA SECTION CONFERENCE

Notable for Record Attendance Which Wartime Program Brought

A Report by
JOSEPH E. YOUNG
Superintendent and Engineer
Water and Light Department
FERGUS FALLS, MINN.

THE 26th Annual Conference of the Minneapolis Section of A.W.W.A., held in St. Paul, Minnesota, Sept. 24-25, was notable for its record attendance. The registered attendance was 174 this year as compared to 157 last year when the Association's Henshaw Cup was won by the Section for high percent member attendance.

W. P. Tarbell, City Engineer, Fargo, N. D., presided as chairman at the sessions and at the business meeting.

New Officers

The following officers were elected to serve during the ensuing year:

Chairman

U. J. Seibert, Chemist, Filter Plant, St. Cloud, Minn.

Vice-Chairman

Frank Raab, Sr., Chemist and Bact., Fridley Softening Plant, Minn.

Trustees

Herbert Grove, Eng. and Supt., Board of Water Comm., Stillwater.

Joseph E. Young, Supt.-Engr., Water and Light Dept., Fergus Falls.

D. B. Morris, C. B. Lyon & Bro., Inc., St. Paul.

Edgar W. Johnson, Senior Engr., Minneapolis Water Dept., is the new National Director.

R. M. Finch, Wallace & Tiernan Co., Minneapolis, who has been secretary of the section for many years, was retained in that capacity.

Resolutions

A resolution was adopted at the business meeting calling attention to the heavy increase in pollution above the intake of the Minneapolis water plant where the Coli Index has risen from 1190 per hundred cc. in 1930 to 4688 per hundred c.c. in 1941. The resolution asked that the legislature provide sufficient funds so that the State Board of Health might investigate and provide corrective measures for this pollution.

A resolution was also adopted advocating that water utilities join with the Civilian Defense in distributing information concerning protective measures.

The Author

The Section also went on record as recommending and endorsing Mr. Leonard Thompson, practical operating man of years of experience and an active member of A.W.W.A., for vice-president of the national organization. They also solicited support of adjoining sections in advancing Mr. Thompson to this office.

Little Interest in Operator Licensing

R. A. Thuma reported for the Committee on Licensing which had drawn up proposed regulations for licensing water works operators. The report of the committee was tabled at last year's session. Mr. Thuma reported that he had received expressions from a number of operators throughout the state and he felt that they did not show very much interest in licensing. Accordingly, on motion of Mr. Thuma, the report of the committee was withdrawn and the committee discharged.

Fuller Award to Mellen

The closing feature of the conference was the Annual Dinner, with entertainment of high quality, at which Arthur F. Mellen was announced as the recipient of the Geo. W. Fuller memorial award "for services rendered in pioneering a water works school for the state of Minnesota." Mr. Mellen is chief chemist for the Minneapolis Water Department.

Technical Sessions

During the technical sessions interesting talks were given by W. W. Brooks, representing the Rationing Board, and W. G. Kearney of the Goodrich Co., who outlined the situation in regard to rationing tires and the possibility of acquiring tires and retreads. Water department equipment would be eligible for rationed retreads. It was emphasized, however, that everyone should do his part to conserve tires to the greatest extent possible, as it will probably be some time yet before tires and retreads will be freely available.

"Priorities and Water Works Materials" was the subject of Mr. Lee Jensen of the Minneapolis office of the War Production Board. He explained that although the priorities system was not foolproof it served a useful purpose. As to water works construction and maintenance, because both called for materials which were vitally needed in the war effort, he felt that the situation probably would get worse before it got better. His advice was that when in doubt or in trouble water works men should appeal to their nearest regional W.P.B. office.

The panel discussion on the problem of **"Operation of Water Works With Substitute Materials"** was participated in by L. N. Thompson, St. Paul; A. M. Kircher, Mankato, and A. C. Wallace, Jackson.

The present emergency demands that water works men forget some of their training and use substitutes, rather than attempting to hold to conventional materials now among the most critical. With an effort such as the nation is now engaged, economy of materials and not of operating expenditures must be the keynote. "Saran," "Tubeloy," and asbestos cement pipe were mentioned as materials which might be available and which had considerable merit. The immediate situation probably does not have to be viewed with great alarm, but meter repair procedure will of necessity be greatly modified. Effort and ingenuity will have to be substituted when usual materials are not available. Cooperation should be exercised between utilities in furnishing necessary materials.

"Care and Maintenance of Elevated Steel Tanks," by N. W. Viebahn and J. C. Bang, Litchfield. Mr. Bang stated that in his experience, covering upwards of 50 years, good painting results could be obtained with red lead and oil properly applied. Experiences in dealing with racketeering contractors who charged so much for removing leaky rivets and leave the tank in worse condition than when they arrive were also detailed. In drawing repair and painting specifications great care should be exercised that persons with proper experience whose primary purpose is to do a good job are secured. The idea was also advanced that the comparatively new cathodic protection for water tanks would certainly justify trial on the basis of experience of other water works.

In discussing **"Water Supply and the Civilian Defense Program,"** Major Wm. H. Cary, Jr., U.S.P.H.S., Chicago, Ill., set forth in detail the important part that the water supply plays in civilian defense. Mr. Cary emphasized and stressed the importance and cooperation between utilities in the matter of exchange of needed materials and crews in times of disaster.

Defense of water supplies against sabotage and detailed methods and experiences of protecting water supplies against possible sabotage were explained by O. E. Brownell, of the Minn. State Dept. of Health.

"Safety Appliances in Water Plants," as discussed by V. W. Buys, Minneapolis, deal with the possibility of physical injury, infection, and gas hazards—all of which exist in many water plants.

"Taste and Odor Control," by Wm. D. Hurst, Water Engineer, Winnipeg, Canada. In this paper, Mr. Hurst set forth the problem encountered in eliminating taste and odor from the Winnipeg supply. All known methods of taste and odor elimination were considered. Carbon was tried but because of the fact that filters were not available some difficulties were encountered. The taste and odor was finally eliminated by breakpoint chlorination of the entire supply at a point one hundred miles from the city at the intake located in Lake of the Woods. It was found that the use of copper sulphate was desirable, as it reduced the amount of chlorine required.

"Progress Report of Water Softening at Minneapolis," by Frank Raab, Sr., chemist, Minneapolis Water Dept. The Minneapolis plant has been in operation about one year, and it is believed that improvements in the process would result if carbonic gas were available for recarbonation. Due to the war, however, such equipment cannot be obtained. It was found that the softening of water eliminated 90 per cent of the bacteria. However, due to the heavy pollution of the river above the intake, it is found necessary to carry nearly 3 p.p.m. of chloramine residuals in the finished water in order to furnish a water which is deemed safe for consumption.

"Water Softening Problems at the Twin City Ordnance Plant," by Howard J. Sowden, New Brighton, constituted a review of experiences with Zeolite softening, wherein it had been found more economical and desirable, as far as the process was concerned, to soften the water to zero hardness rather than produce a product of 5 grain hardness.

Paul Weir Now Ass't Gen'l Manager of Atlanta Water Dept.

Paul Weir

W.P.B. tried to get the Atlanta Water Department to release Paul Weir, Supt. of Filtration, for the duration, but Atlanta needed the man at home—so much so, in fact, that Paul has this month been made Assistant General Manager of the entire Water Department at the request of General Manager Zode Smith.

Until now Mr. Weir has been nominally Atlanta's Supt. of Filtration, but we understand that his duties in recent months have extended beyond the filtration plant. In his top flight job he has worked his way up from a beginning some 14 or 15 years ago as Laboratory Assistant.

Paul obtained his training at Hamilton College and Georgia Tech. Since 1929 he has been a member of A.W.W.A. He has served as Chairman of A.W.W.A.'s Southeastern section, the Water Purification Division, was voted the Geo. W. Fuller Award for conspicuous achievements in 1940, and in 1941 won the Goodell Prize for the most meritorious paper of the year.

He has served also on several committees of the Water Purification Division and his studies at the Atlanta plant have won for him recognition and distinction.

Paul Weir was one of the founders of the Georgia Water and Sewage Works Association and became an energizing force behind the highly successful Annual Georgia Short School for Water and Sewage Operators, which was sponsored jointly by the Association, the State Dept. of Health and Georgia Tech. At present he is a lecturer on Public Health Engineering and National Defense at Georgia Tech. He is an Associate member of the Am. Society of Civil Engrs. and serves the State Qualifications Board in the matter of engineer licensing.

In short, Paul Weir has won his spurs and the deserved advancements to the positions which make him next in command to the General Manager of Atlanta's water supply system—an outstanding achievement for a man relatively so young. And we know, too, that if that stellar water works man "Bill" Rapp, former Supt. of Construction and Distribution at Atlanta, is looking down he is wearing a smile of marked satisfaction over the recognitions which have come to his early protege—the sorrel-topped go-getter, Paul Weir.

Wood Manhole Covers? Possible If Worse Comes to Worse

The city of Madison, Wis., may contribute 1,800 tons of cast iron to the war effort if experiments being conducted by the Forest Products Laboratory are successful. The laboratory, according to T. F. Harrington, City Engineer, has been requested by the War Production Board to determine whether or not it would be practicable to replace the cast iron manhole and catch basin covers in the city with wooden covers. If so a source of many thousands of tons of cast-iron will become available in the war effort.

This may be classified as a brand of "Imagineering"—perhaps impracticable, but it shows thinking in the right direction. Who will have another similar suggestion to offer?

IMPORTANT INFORMATION

The following information was recently distributed from A.W.W.A. Headquarters to all members of the Association. Its importance warrants reprinting portions of the release.

Unofficial but reliable information is herewith transmitted concerning the fields of jurisdiction of the Power Branch and the Bureau of Governmental Requirements — both within the War Production Board.

Exclusive jurisdiction lies in the Power Branch over all matters (including all applications for priorities assistance) relating to the operation or activity of producing, treating, transmitting or distributing natural or manufactured, gas, *water*, or electric energy or power, whether by private companies, corporations, individuals or by any government or governmental agency whether federal, state, county or local.

Primary jurisdiction lies in the Bureau of Governmental Requirements over all matters (including applications for priorities assistance) concerning the activities of sewerage operations and projects, whether publicly or privately owned (*except*) in any case where a sewerage project or operation is conducted in conjunction or connection with the operation of a water system, the written recommendation of the Power Branch shall be obtained by the Bureau of Governmental Requirements before action is taken by the latter.

Applications for prority assistance for water works must explain very adequately the need for the work planned. Either the Project Application form—PD 200, or the Preference rating form PD-1A must be used. Be sure to obtain from the nearest W.P.B. Branch office the latest issue of the form for use. Do not confine the outline of facts to the space on the forms. Explain the circumstances fully in a covering letter addressed to the Power Branch, War Production Board, Washington, D. C. Tell everything that you would need to know if you were in the position of passing upon the request. This is *imperative* and *essential* to favorable consideration of any application.

Do not apply for anything for which the need is not essential. Its relation to the war effort must be clearly shown and be clearly evident *or* the anticipated breakdown of existing facilities must be demonstrated.

The restrictions upon purchasing, or holding in inventory, critical materials by water works are evidently going to be more instead of less, severe. Face these facts and govern your attitude accordingly. The Mutual Aid Plan is going to be the bulwark of water works maintenance for the duration. The time is past for reluctance or non-cooperation. Every water company or department must work with the responsible group in its state to the end that the mutual help plans work out satisfactorily.

The attitude of Selective Service officials regarding a special occupational deferment bulletin relating to water works has not changed. The bulletin is still being considered but has not been issued.

If you know of a skilled water works man (maintenance worker, pumping station engineer, chemist, etc., etc.), who has been drafted and who wishes to work in the Army camp water works or sanitation service, send to this office his name, skill, *serial number*, location, rank, etc. If a sufficient number of such cases can be found, it may be possible to develop a change in Army policy. Manpower is short in every field and must be used where fitted and most greatly needed.

Water Rate Increase Protested by O.P.A.

The following newspaper account is the first case which has come to our notice in which the Office of Price Administration has intervened in hearings of water rate increases.

OPA today protested Commonwealth Water Co.'s application for permission to raise its rates 15 per cent in 11 Essex and Union County municipalities. The action, before the Public Utilities Commission, was the first instance in which OPA intervened in a water rate case.

W. Russell Gorman, attorney for the public utilities section of OPA in Washington, stated before the commission:

"Approval of an increase in utility rates because of increased federal income taxes will be contrary to the intention of Congress, inflationary in character and would adversely affect OPA's program and policy to stabilize prices.

"Increases in consumers' rates and charges unless fully warranted under present emergency conditions due to the war are contrary to the policy of the government to prevent increases in cost of living."

Gorman pointed out that Commonwealth based its request for increased rates on the necessity of compensating for higher operating costs and federal income taxes and to permit the company to obtain a higher rate of return than in recent years.

Water service payments, Gorman said, represent regular cost-of-living items for virtually all residents of communities served by Commonwealth. He added:

"The question of under what circumstances water rates should be increased during this national emergency resulting from the war is one of basic national importance in which OPA has a substantial interest."

Sewage Federation Exhibits

The following 27 firms are to be represented with exhibits at the forthcoming Wartime Conference of the Sewage Works Federation at the Hotel Statler in Cleveland, Ohio, Sept. 22-24. By the time this item appears there may be others added, inasmuch as the list continues to grow.

EXHIBITORS

(27 Firms Taking 34 Booth Spaces)

Aluminum Co. of America
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American Well Works
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Carter Co., Ralph B.
Chain Belt Co.
Chapman Valve Mfg. Co.
Chicago Pump Co.
Dorr Company, Inc.
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Flexible Sewer-Rod Equipment Co.
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Vapor Recovery Systems Co.
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Yeomans Brothers Co.

The Editor's Comments

Who Needs What; Who Has Which?

THESE are the two questions which from here out are to demand the attention of water works men and all who are taking a helpful part in aiding water works managers who may need help in the procurement of materials. What is referred to in this instance is the matter of securing materials and equipment most needed in operation and maintenance, but more particularly to the problem of redistributing surplus inventory now accumulated in the storerooms and yards of water works all over the nation.

Considerable progress has been made with the Mutual Aid Plan in the water supply field, looking to the possible needs of a community should it suffer an aerial enemy attack, sabotage, or any other occurrence which results in a crippled water supply system. The central or pooled inventory scheme as a part of the Mutual Aid Plan has been one of the principal features of this protective device which has already in some States demonstrated its workability and worth in times of need. Now the Mutual Aid Plan is destined to become a medium of mutual aid in a very real sense—without the occurrence of a catastrophe to bring it into serviceable operation. In this regard it seems unfortunate that so few of the States have proceeded with developing the Mutual Aid Plan to the extent that will be required to best serve the water supply industry which now has a new problem to face. The present need is for an immediate central or pooled inventory record in each State, for reasons which follow. It is more than something of potential benefit—it is now an essentiality.

Under the new P-46 Order, just issued by the W. P. B. under date of October 10th, water utilities (public and private) are being required to exchange or sell amongst themselves materials and equipment which have been accumulated in inventories now found to be in excess of limitations set in the first P-46 Order covering operation, maintenance and repair. At the same time the permissible procurement of new materials has been reduced to a degree which is to make the exchange or resale of existing utility owned surplus stocks an essential operation if many water utilities are not likely to suffer shortages of consequence.

To begin with, the new P-46 Order reduces the permissible procurement of maintenance and replacement materials and equipment for transmission and distribution systems to just 60 per cent of that of the old P-46 Order which has just expired. On top of this 60 per cent limitation is the requirement that 40 per cent of all transmission and distribution requirements for the immediate future must be supplied out of inventoried stocks already in the hands of water utilities—i.e., from the surplus that exists here and there in the field. On further consideration of what these new limitations really mean, it is apparent that water utilities can purchase from manufacturers and purveyors (referred to as suppliers) only 36 per cent as much new materials and/or equipment for replacements as was purchased by the same utility in the same period of 1940. How this figure is derived is simple. The total in materials (old and new) that can be purchased for use or placing in stock is reduced to 60 cents in contrast to the dollar expended in 1940 and permitted in 1941 and 1942. Then if only 60 per cent of this can be procured from supplies, the net is 60 per cent of 60 per cent. The fact is then that only 36 per cent may be purchased on the new goods market. The balance (24 per cent) of 1940 dollar purchases must be procured in the form of materials which become available for repurchase from *other water utilities.* While this may sound like a rather severe cut in permissible procurement of supplies to be procured in the regular manner, the water utility is far better off than the electric utility, which must depend upon one another for 75 per cent of transmission and distribution materials. For water supply materials other than those specifically for transmission as distribution, only 25 per cent of the permissible 60 per cent of 1940 purchases in dollar value need be procured from other water utilities or dealers in used materials and equipment, whereas 0.75×60 or 45 per cent may be purchased new from manufacturers or other purveyors. And none of these limitations are imposed on the purchase of fuel or water treatment chemicals or equipment constructed of non-critical materials such as lead, glass, plastics, etc.

The new P-46 Order prescribes that a utility may only dispose of surplus stocks over and above a practical working minimum, and then only to a purchaser who can show a priority rating of A-1-J or better. For procurement of both new and resale materials for maintenance, operation and repairs, water utilities are being granted a priority rating of AA-5 in the new order. And a saving clause to many may be the permissibility of ordering emergency supplies and equipment reasonably in advance of anticipated breakdown to the extent of 30 per cent of that which the new order permits under normal operation and maintenance. For such materials an AA-2X priority is assigned. Although this amounts to only 18 per cent (60×30) of 1940 purchases in a given quarter, it will serve a highly useful purpose in preventing possible plant shutdowns because of too great depletion of inventory and/or unanticipated needs. Still another clause permits procurements for unavoidable or potential emergency situation materials above the normal practical working minimum so long as the ordered items do not run in excess of 5 per cent of withdrawals of the same class of material in the year 1940.

It is apparent that flexibility has been provided by W. P. B. in its new P-46 Order where emergencies or unusual operating and maintenance conditions must be provided for. It is likewise apparent, however, that an adequate re-distribution of surplus stocks existing here and there in the water supply field is a MUST. To make this possible, W. P. B. is ready to issue special orders where such may prove necessary to over-ride existing statutes normally preventing resale of materials or equipment by governmental subdivisions. The important questions which must be answered before the imposed plan of redistribution can be successfully put into effect are *"Who has what?"* that is subject to resale. This can definitely best be answered through a central or pooled inventory. Logically, the proper authority to catalog surplus inventory is the State Water Coordinator.

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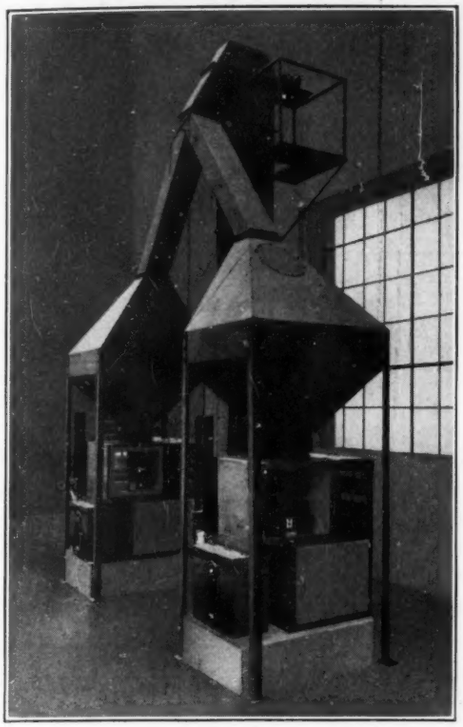

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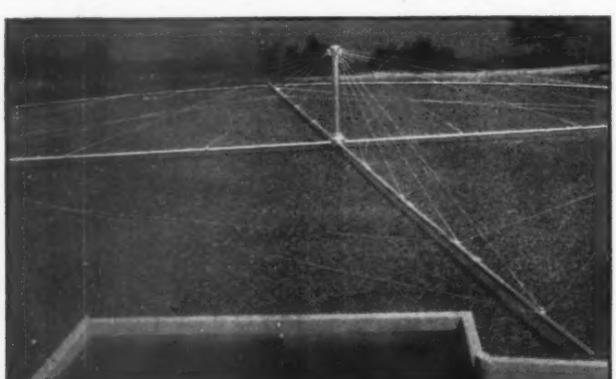

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MEETINGS SCHEDULED

Oct. 15-16—ALBANY, N. Y. (DeWitt Clinton Hotel)
New York Section A.W.W.A. (War Conference.) Sec'y-Treas., R. K. Blanchard, 50 West 50th St., New York, N. Y.

Oct. 15-16—ATLANTA, GA. (Ga. School of Technology)
Georgia Water and Sewage Association. Secretary, T. T. Gunter, Chief Operator, Pressure Filter Plant, Atlanta, Ga.

Oct. 18-21—CLEVELAND, OHIO (Statler Hotel)
American Public Works Association. (Annual Public Works Congress.) Exec. Dir., Norman Hebden, 1313 East 60th St., Chicago, Ill

Oct. 19-21—PADUCAH, KY. (Irving Cobb Hotel)
Kentucky-Tennessee Section A.W.W.A. Secretary, H. D. Schmidt, Div. San. Eng., State Dept. of Health, Nashville, Tenn.

Oct. 20-21—WAUSAU, WISC. (Hotel Wausau)
Wisconsin Section, A.W.W.A. Secretary, Leon A. Smith, Sup't of Water Works, City Hall, Madison, Wis.

Oct. 21—HARRISBURG, PA. (Penn-Harris Hotel)
Pennsylvania Water Works Association. (Meeting devoted to Wartime Problems.) Secretary, F. Herbert Snow, 507 Telegraph Bldg., Harrisburg, Pa.

Oct. 22-24—CLEVELAND, OHIO (Hotel Statler)
Federation Sewage Works Associations. (3rd Annual Convention.) Sec'y, H. W. Wisely, Urbana-Champaign Sanitary District, Urbana, Ill.
(In conjunction with Ohio Conference on Sewage Treatment and immediately preceded by the A.P.W.A. Annual Congress in this same hotel.)

Oct. 22-24—CLEVELAND, OHIO (Hotel Statler)
Ohio Conference on Sewage Treatment. (Meeting with Federation of Sewage Works Associations). Sec'y-Treas., W. D. Sheets, 568 E. Broad Street, Columbus, Ohio.

Oct. 23-24—ST. LOUIS, MO. (Coronado Hotel)
Missouri Valley Section, A.W.W.A. Sec'y, Earle L. Waterman, 104 Engineering Hall, University of Iowa, Iowa City, Ia.

Oct. 27-30—ST. LOUIS, MO. (Jefferson & Statler Hotels)
American Public Health Association. Exec.-Sec'y, Dr. Reginald M. Atwater, 50 West 50th St., New York, N. Y.

Oct. 28-30—OAKLAND, CALIF. (Hotel Oakland)
California Section, A.W.W.A. Sec'y, H. Arthur Price, Dept. Water and Power, 316 West 2nd St., Los Angeles, Calif.

MEETINGS SCHEDULED

*Oct. 29-30—TORONTO, ONT. (Royal York Hotel)
Canadian Institute on Sewage and Sanitation. Sec'y-Treas., A. E. Berry, Ontario Department of Health, Parliament Buildings, Toronto, Ont.

Nov. 3-4—DURHAM, N. C. (Washington Duke Hotel)
North Carolina Section, A.W.W.A. and North Carolina Sewage Works Ass'n. (22nd Annual Joint Conference.) Sec'y, R. S. Phillips, Chief Chemist, Water Department, 206 Dacian Ave., Durham, N. C.

Nov. 5-6—RICHMOND, VA. (Jefferson Hotel)
Virginia Section, A.W.W.A. Secretary, F. H. Miller, Ass't Engr., Bureau of Sanitary Engineering, Dept. of Health, Richmond, Va.

Nov. 9-10—HANNIBAL, MO. (Mark Twain Hotel)
Missouri Water & Sewerage Conference. Sec'y-Treas., W. A. Kramer, State Board of Health, Jefferson City, Mo.

Nov. 9-10—PITTSBURGH, PA. (Wm. Penn Hotel)
3rd Annual Water Conference. Sponsored by Engineers' Society of Western Pennsylvania. H. M. Olson, Conference Chairman, 171 Longuevue Drive, Pittsburgh, Pa.

Nov. 12-13—PARKERSBURG, W. V. (Chancellor Hotel)
West Virginia Section A.W.W.A. Secretary, J. B. Harrington, Director, Division of Sanitary Engineering, Department of Health, Charleston, W. Va.

Nov. 12-14—MIAMI, FLA. (McAllister Hotel)
Florida Section, A.W.W.A. Secretary, A. P. Black, Prof. of Agricultural Chemistry, University of Florida, Gainesville, Fla.

Dec. 9—BANGOR, ME.
Maine Water Utilities Association. Sec'y, Earle A. Tarr, Winthrop, Me.

Jan. 20-21—NEW YORK, N. Y. (Eng. Societies Bldg.)
American Society of Civil Engineer's. (Annual Meeting) Exec. Sec'y, Geo. T. Seabury, Eng. Societies Bldg., 33 W. 39th St., New York, N. Y.
(Sanitary Engineering Div. Sessions, Thursday, Jan. 21.)

Jan. 22-23—NEW YORK, N. Y.
New York State Sewage Works Ass'n. (Hotel McAlpin.) Sec'y-Treas., A. S. Bedell, State Dept. of Health, Albany, N. Y.

(Joint Annual Dinner of N.Y.S.S.W.A., and the Sanitary Eng. Div. of A.S.C.E., Jan. 22. Joint inspection trip Saturday, Jan. 23.)

*Change in dates from previous listing.

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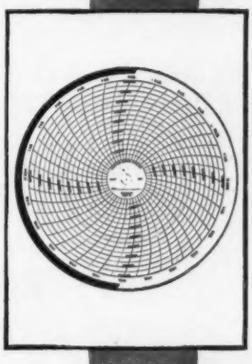

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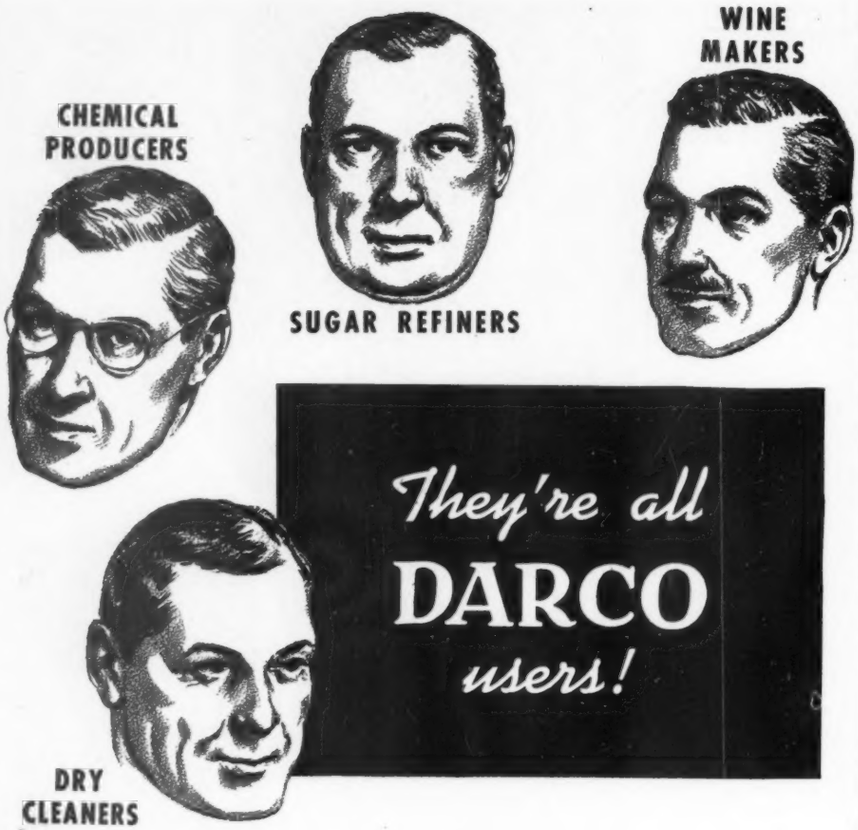

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LITERATURE AND CATALOGS

Cement Dispersion, through the use of "pozzolith," is discussed in a new illustrated folder. Under ordinary construction conditions, sement particles tend to bunch together in water, some particles never contacting the water and others being only partially hydrated. "Pozzolith" is a peptizing agent which drives the particles apart, exposing all cement particles to the vital hydrating action. Such dispersion is said to increase the strength of cement work 25 per cent and to increase its durability up to 50 per cent. Two photomicrographs show the action of cement particles under normal conditions and under the conditions of dispersion through pozzolith. A copy of the leaflet and further information can be had by writing The Master Builders Company, Cleveland, Ohio.

Oakite Compound No. 32, a patented material for the removal of hard water scales, rust and similar deposits from metallic surfaces, is the subject of a newly revised descaling and cleaning manual just issued by Oakite Products, Inc. The manual describes safe and speedy methods of removing lime scales from many different types of water cooled and water circulating equipment. Compound No. 32 removes scale and rust from water meters without pitting the brass, bronze and steel parts. The scale-disintegrating material avoids the obnoxious fumes and handling difficulties often associated with the use of commercial raw acids. An interesting section is that dealing with cleaning of Diesel engine cooling systems, lube oil and jacket water coolers so as to restore normal heat transfer efficiency. The manual explains in detail the different methods for using the de-scaling compound. A copy of this 24-page manual can be secured by writing Oakite Products, Inc., 57 Thames Street, New York, N. Y.

Hot Process Water Softeners are described in Worthington's new illustrated bulletin No. W-212-B2. A simplified two-page diagram shows the design and operating features of a deaerating type softener. An outstanding feature is the primary heater, where water is sprayed through steam by conical spray valves at such an angle as to create a vigorous horizontal rotating motion to the water. This rotating motion continues from the mixing zone through the precipitate prep-

aration zone. In this manner water and chemicals are thoroughly combined, and precipitated particles have a maxmum opportunity to grow in size, thus increasing their settling characteristics. The deaerator is of annular shape fitting symmetrically into the softener tank. As optional equipment the system includes a "proportional sludge remover" which provides a means for frequent small quantity blow-off of settled precipitate in proportion to the amount of raw water delivered to the softener. For a copy of Bulletin W-212-B2 address Worthington Pump and Machinery Corp., Harrison, N. J.

A-C Centrifugal Pumps is the title of Allis-Chalmers' new illustrated Bulletin B-6059-H describing their complete line of centrifugal pumps and pump units. Included in the bulletin are descriptions of single and double suction pumps, single and multi-stage, mixed and axial flow, combined Allis-Chalmers units and special pumps to solve special problems. The "electrifugal," Allis-Chalmers' compact motor pump unit, is recommended for a large variety of wartime applications; these units can operate in almost any position. Diagrams and photographs show the important features of all pumps and the uses for which they are recommended. For a copy of Bulletin B-6059-H address Allis - Chalmers Mfg. Co., Milwaukee, Wis.

Wood Stave Pipe and Tanks are comprehensively and timely treated in Federal Pipe and Tank Company's new Catalogue No. 19. The handsomely bound book contains over 300 pages of tables, photographs and descriptive material. After an introductory section on the economics of wood pipe, including a comparison of untreated and creosoted pipe, the catalogue gives complete specifications and construction details of Federal's continuous stave wire-wound pipe, and semi-circular flumes and wood stave tanks. Besides numerous tables on water flow and head, some fifty pages of mathematical and miscellaneous tables are included. Among these are tables of trigometric functions, decimal equivalents, board footage of lumber, circumference and area of circles. The final section tabulates list prices for all sizes of pipe and tanks. A copy of Catalogue No. 19 can be obtained by writing to the Federal Pipe and Tank Co., 5851 East Marginal Way, Seattle, Wash.

Two-stage Centrifugal Pumps of the opposed impeller type or described and illustrated in a 12-page catalogue recently issued by the De Laval Steam Turbine Company. By mounting two single-suction impellers with their suction openings facing in opposite directions the pump is balanced hydraulically. Only two pairs of wearing rings are needed, no more than for a single stage pump. The catalogue explains other notable features of the opposed impeller series pumps and contains photographs of several models. A large cross-sectional drawing shows all important parts of the pump. Tables of dimensions and capacities are given. Pump sizes range from capacities of 50 gallons per minute to 1,500 gallons per minute, for heads from 80 feet to 800 feet. For a copy of the catalogue, No. B-3, address the De Laval Steam Turbine Co., Trenton, N. J.

Butterfly Valves are the subject of Bulletin No. 15-B recently issued by the R-S Products Corporation. These precision-machined, heavy-duty valves serve as both flow and pressure regulators and as wedge-

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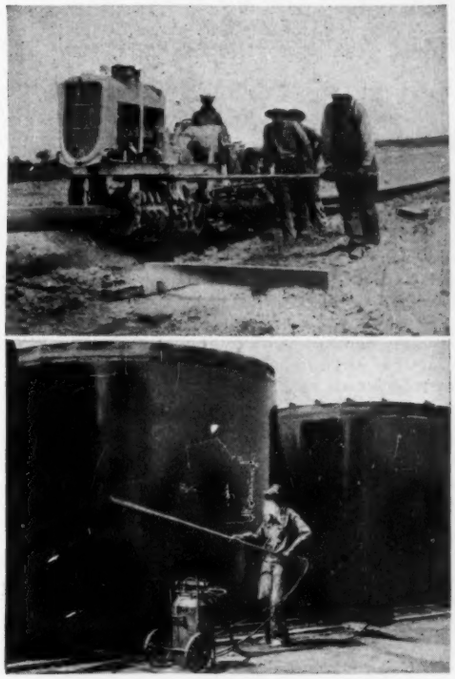

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Layne-Ohio Company.....Columbus, Ohio
Layne-Texas Company.....Houston, Texas.
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Layne-Western Co. of Minn.....Minneapolis, Minn.
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Foxboro Control Instruments for measurement and control of industrial processes are all described in their new comprehensive Catalogue No. 95-A. The 48-page book is divided into ten sections, six of them grouping and discussing instruments and accessories used in such fields of application as Temperature, Flow, Pressure, Level, and Humidity. The remaining sections cover combination instruments, valves, instrument panels and similar subjects. The book contains over 200 illustrations and its contents are cross-indexed to facilitate choosing the proper instrument for a given task. Copies of Cat. No. 95-A may be had by writing The Foxboro Company, Foxboro, Mass.

A-C "Lo-Maintenance" Motors, for a wide variety of industrial and water works applications, are described in their new 12-page illustrated Bulletin B-6052-C. All facts necessary for quickly choosing the correct motor for a given application are conveniently tabulated. Rating, duty, torques, starting current, efficiency and slip are given for each design, whether squirrel-cage, wound rotor, direct current or synchronous motors. Construction features of various models are described in detail, and numerous typical applications are illustrated. The bulletin discusses the recommended use of higher speed motors and adjustable speed to increase efficiency and cut down operating cost. Dimension ratings and price lists are included. Copies of Bulletin B-6052-C can be obtained from Allis Chalmers Mfg. Co., Milwaukee, Wis.

Precision Balances, which provide highly accurate weighing in the hands of unskilled or semi-skilled workers, are described in a late catalogue issued by the Roller-Smith Company. The two new instruments, Models B-1 and MB, are modified versions of the Model B, which has been used in industrial plants and laboratories for several years. They utilize the same mechanism and have the same guaranteed accuracy of 1/5 of 1 per cent tight shut-offs. Complete tables of dimensions are given for the 150, 300, and 600 lb. Class B valves. R-S butterfly valves are recommended for oil, vapor, air, gas, steam, water and chemicals, under high and low pressures and temperatures. For a copy of the four-page bulletin, address R-S Products Corporation, Wayne Junction, Philadelphia, Pa.

CONVENTION — OCT. 1942 FEDERATION SEWAGE WORKS ASSOCIATIONS

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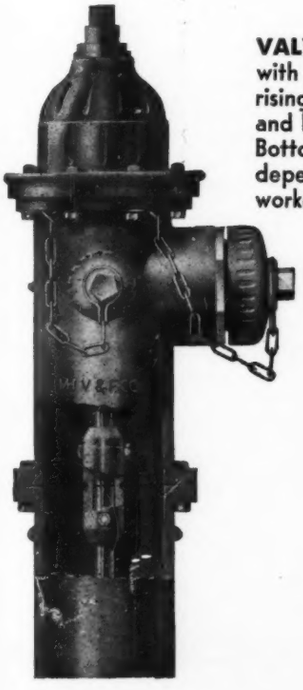
B & B Fittings
Cutting-in Tees



VALVES: A.W.W.A. type, iron body, bronze mounted with double-disc parallel seat or solid wedge type. Non-rising stem, outside screw and yoke, or with sliding stem and lever. Also furnished hydraulically operated. Square Bottom type operates in any position. All rugged and dependable, made of best material with highest quality workmanship.

HYDRANTS: Standard A.W.W.A. type approved by Underwriters and Factory Mutuals. Dry top, revolving head, easy to lubricate. High efficiency because barrel diameter not reduced and there are no working parts or obstructions in waterway. SPECIAL TRAFFIC MODEL (shown at left) is designed to yield at ground line under impact, repair being simply renewal of breakable bolts and breakable coupling on stem.

M&H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

of full scale value. The MB balance is provided with a weighing chamber to protect hook and weighing sample from drafts. Both models are available in range sizes from less than 3 mg. to over 50 grams. For further information, write for Catalogue 4550, from Roller-Smith Company, Bethlehem, Pa.

"Pittsburgh Plate Products," the bi-monthly house magazine of the Pittsburgh Plate Glass Company, has recently released its jubilee issue commemorating the fiftieth anniversary of the publication. The magazine, first published in March, 1892, under the title "Patton's Monthly," has compiled a wealth of historical and descriptive material dealing with paint, glass, and chemical products. Pittsburgh Plate Glass has been producing heavy chemicals for over forty years. Their Barbeton plant produces large quantities of soda ash, chlorine, bicarbonate of soda, calcium chloride, liquid and solid carbon dioxide. If interested in the jubilee issue of "Pittsburgh Plate Products" request a copy from Pittsburgh Plate Glass Co., Grant Building, Pittsburgh, Pa.

The Centrimax Flowmeter, described in a new Leeds & Northrup 20-page catalogue, is a high-accuracy instrument for measuring and integrating flow of water, steam and other fluids. It is especially recommended for conditions where accounting is done on the basis of flow readings or where power efficiency is at stake. The meter is highly reliable and practically free from maintenance. When used in central stations and power plants its aid in maintaining maximum efficiency, by accurate measurement of steam and water flow, quickly pays for the original cost of the equipment. To receive a copy of the new catalogue address Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia, Pa.

"Wartime Conservation in the Office" is the title of a new Metropolitan Life brochure which has been produced by the Policy Holders Service Bureau to advance the curtailment of waste in office operations. The procedures employed by a number of companies to inaugurate or intensify existing waste reduction programs are outlined in the brochure which may be had for the asking. Address the Policy Holders Service Bureau, Metropolitan Life Insurance Co., No. 1 Madison Ave., New York City.

for QUICK REPAIRS

in WINTER EMERGENCIES!

When Jack Frost starts playing around, you will need some of these improved sleeves for quick, economical, effective repair of broken mains. Keep several of different sizes on hand and avoid costly delays during cold weather. On the market for 13 years and many thousands in use. Order from shipping point nearest you as follows: Birmingham, Dallas, Kansas City, Los Angeles, Minneapolis, San Francisco, Pittsburgh.

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BIRMINGHAM, ALA.

Dallas Houston El Paso Pittsburgh Kansas City
Chicago Minneapolis New York City Cleveland
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My family was worried

"Certainly glad I stop at recognized hotels on my many business trips. Once, serious illness developed suddenly at home. Though I'd left no forwarding address I was easily traced to my hotel by phone."

D. B., Rochester, New York.

AMERICAN HOTEL ASSOCIATION

FOR A FRESH START
STOP AT A **HOTEL**

A NEW COST DATA BOOK

Road and Street Construction Methods and Costs

BY

HALBERT P. GILLETTE

AND

JOHN C. BLACK

This book was planned and compiled expressly for use by contractors, engineers and highway officials.

It is not a textbook, but is a compendium of data carefully selected with reference to their usability by highway builders and other persons concerned with highway construction costs.

In general the data are of two main classes—dollar and cents costs per mile, per square yard, per cubic yard, and the like, for use in quick approximate estimates; and details of material, labor and equipment costs, with records of man-hours and machine-hours, for use in close estimating and in studies to reduce costs or improve methods.

The data are from a great number of different sources, and are in widely varying detail.

All major articles carry descriptions to show clearly the class of work and the methods for which costs are given, and to provide a basis for further reference and study if desired.

Location and date of job and the source of information are given in the title and introduction to each article.

The grouping of subjects in chapters is convenient, but an unusually complete index is furnished as the main guide to any subject or sub-subject sought.

The authors are both men of practical experience in highway and other construction. Both are members of the American Society of Civil Engineers.

The book is filled with useful data, and its answer to just one question may easily be worth hundreds of times its price.

608 pages—hard cloth binding—price $6.00

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330 South Wells St., Chicago, Ill.

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Please send me a copy of "Road and Street Construction Methods and Costs" for examination. Within 10 days I agree to remit $6.00, plus postage, or return the book postpaid.

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Williams Equipment for Power Plants is described and illustrated in Catalogue No. 142 just published by the Williams Gauge Co. of Pittsburgh. The new 24-page catalogue contains technical data on Williams' complete line of power plant accessories. Included are descriptions of pump valves, water gauges, steam pump governors, gauge cocks, ball-type high pressure steam traps, safety feed water regulators, high and low alarm columns, flanged silent check valves and standard feed regulators. For a copy of Catalogue No. 142, write to the Williams Gauge Co., 2068 Pennsylvania Ave., Pittsburgh, Pa.

"It's the Little Things That Count" is the title of an attractive booklet recently issued by Allis-Chalmers to assist in America's war on waste. Suggestions are made for the conservation of stationery, file folders, rubber erasers, etc. Simple ways for taking care of typewriters and pointers on the restricted use of lights and telephones are given. The importance of such conservation is strikingly presented with amusing sketches. The booklet closes with ten rules which office workers should follow to prolong the life of their materials. For Conservation Booklet E6222, write Allis-Chalmers Mfg. Co., Milwaukee, Wis.

"101 Suggestions for Good Operating Practice," a new Johns-Manville operating manual, contains many practical suggestions on how to obtain the best service from insulating materials. The book tells how to prolong the life of packings, pipe insulation, composition roofing and flashing, brake linings, etc. All information is conveniently tabulated to form a handy guide for maintenance engineers interested in conservation. For a copy of the manual write Johns-Manville, 22 East 40th St., New York, N. Y.

Worthington Type CY Centrifugal Pumps are described in an illustrated leaflet recently received from the manufacturer. These single-stage centrifugals are furnished with either belt or motor drive. Contained in the leaflet are specifications for the standard pumps, a cutaway drawing of its working parts, and tables giving g.p.m. and total head capacities. Type CY pumps are recommended for pumping hot or cold water, brine, light oil, drainage and process waste. For a copy of the leaflet write Worthington Pump and Machinery Corp., Harrison, N. J.

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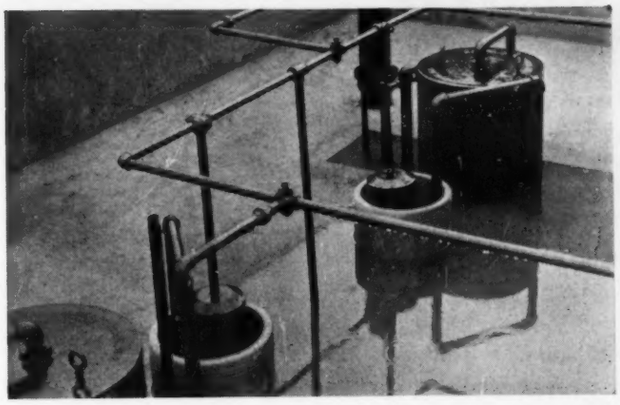

Designed for trouble free operation and guaranteed to give a quick uniform distribution in alternate cycles, the Carter siphon has proven itself as equipment worthy of consideration on your next sewage treatment plant.

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WYCKOFF Since 1855

LOWER labor, installation and maintenance costs. Long life, no electrolysis, contamination of water, or destruction by sulphur, salt water or other mineral impurities. New type Wyckoff California Redwood Pipe for water supply and sewage lines is a proven product.

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THE *Bailey Synchro-Meter* GIVES YOU *Flexibility* IN METERING APPLICATIONS

● This meter panel includes both direct mechanically operated Fluid Meters and Bailey Synchro-Meters, which are electrically operated by remote transmitters.

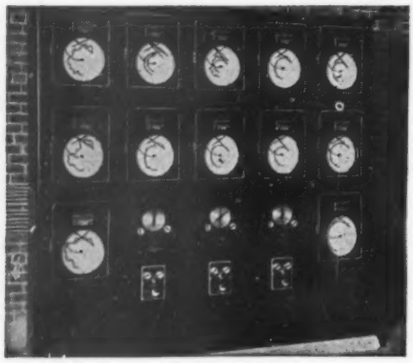
Wherever you have need for a central meter panel incorporating both mechanically and electrically operated Fluid Meters, it is possible to maintain uniformity and neatness by employing this system of transmitting meter and recorder readings.

Readings of flow, pressure, temperature, liquid level and other factors are accurately and quickly transmitted from out-of-the-way places to the receiving indicator, recorder or integrator by the Bailey Synchro-Meter.

This electrical mechanism which is completely described and illustrated in Bulletin No. 194-A, can also be used to eliminate the necessity of running high pressure piping up to meter and control panels.

Write for your copy of this new Bulletin.

MU-17



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One of two Multi-Capacity Blowers at Lansing, Mich. Capacity 4000/2667/1333 CFM; 175 H.P.; 575 R.P.M.; direct motor connection.

Roots-Connersville Multi-Capacity Aerating Blowers, driven from constant speed motors, offer you the capacity advantages of THREE separate blowers, plus the economy advantages of a compact ONE-UNIT installation. The housing is divided into two sections of different size, each having a set of impellers. By opening one of the by-pass valves, either set of impellers can be unloaded completely, thus giving three efficient capacity points for economical aeration at varying flow rates.

War-time demands naturally control production schedules, making it advisable to study future equipment requirements now.

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Roots CONNERSVILLE SINCE 1854

MULTI-CAPACITY Aerating BLOWERS

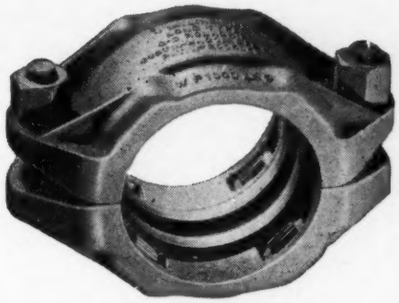
Worthington BBG Gas Engines, described in the new Bulletin No. S-550-B20, are totally enclosed four-cycle gas engines of heavy duty construction but simple and compact in design. The BBG engines are suitable for operation on sewage sludge gas, or can be furnished with a carbureter for operation on gasoline. They may be used for generator or equipment drive. A detailed description of the design and operation features of the engine is supplemented by photoggraphs of engine parts and cross-sectional drawings of the complete unit. A deep sump in the base allows plenty of space for oil storage for the featured lubrication system, designed to provide positive lubrication for all moving parts. Complete dimensions of both 175 h.p. engines are given. For a copy of Bulletin S-550-B20, write to Worthington Pump and Machinery Corp., Harrison, N. J.

Wiley's Engineering Handbooks, which have a bearing on defense work, are the subject of a recently received 12-page bulletin. Among the standard works briefly described are Hudson's "The Engineers' Manual," second edition (Jan., 1939); Eschbach's "Handbook of Engineering Fundamentals"; "Electric Power" and "Electric Communication and Electronics," both volumes a part of "Pender's Electrical Engineers' Handbook"; Kent's "Mechanical Engineers' Handbook," eleventh edition; Peele's "Mining Engineers' Handbook" (1941); Merriman's "American Civil Engineers' Handbook"; and Kidder-Parker's "Architects' and Builders' Handbook." For this new bulletin of Engineering Handbooks write John Wiley & Sons, Inc., 440 Fourth Ave., New York. N. Y.

Two-Stage Centrifugals, by Ingersoll-Rand, are described and illustrated in a new 12-page bulletin containing photographs and cross-sectional drawings of various models. These "Class GT" units, with capacities ranging from 100 to 2,200 gpm., may be had with electric motor, steam turbine or gas engine drives. The bulletin describes the structural features of the pumps in detail. Supplementing the text are performance tables and a tabulation showing the friction of water in various sizes of pipe. For additional information about I-R two-stage centrifugals, request Bulletin 7167 from Ingersoll-Rand Co., 11 Broadway, New York, N. Y.

EQUIPMENT NEWS

"Rolagrip" Couplings



• "Rolagrip" Pipe Couplings, offered by Gustin-Bacon Mfg. Co. of Kansas City, constitute a novel and simple means of joining plain or beveled end pipes of steel, cast-iron.

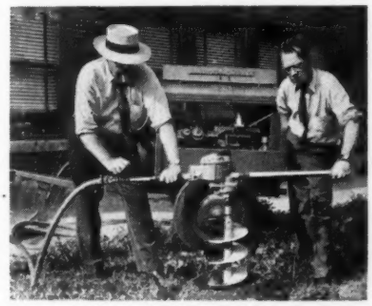
The construction of the "Rolagrip" coupling is extremely simple as is its installation. On the interior of the split coupling are 4 inset ribbed rollers which grip the abutting pipe ends firmly. The recesses within which the ribbed rollers operate are proportioned so as to give play to the forces of expansion and contraction and permit a maximum of angular deflection. Where contraction is so excessive as to cause possible separation of a line at the joint the gripping rollers, by greater constriction of the recesses, dig in to prevent further separation of the pipe ends.

In use of the unique "Rolagrip" coupling no special processing of pipe ends is required. The single rubber gasket is stretched over one pipe end and slid back beyond the rim. The pipe ends are then abutted and the gasket is slid back until centered and seated equally on both sides of the joint. The gasket grooves of the coupling housing are then lubricated. The lower half of the coupling is placed over the gasket and then the upper half, after which the two halves are bolted up for final tightening with a wrench.

The "Rolagrip" coupling is cast from corrosion resisting copper bearing malleable iron, the rollers being of case hardened steel and cadmium plated. The bolts are of extra heavy construction fitted with long nuts. Exact specifications and a more detailed illustrated description is given in a special "Rolagrip" bulletin. For a copy write Gustin-Bacon Mfg. Co., Kansas City, Mo.

K-M Earth Drills

• The K-M portable Earth Boring Drills, manufactured by Ka-Mo Tools, Inc., of Chicago, have a multiplicity of uses in the drilling of post holes of all sorts; holes for tree or shrub planting; holes for exploratory purposes, of any nature, such as location of water main leaks, sewer leaks, etc., without cutting large areas of paving; holes for draining ditches by pumping, etc. With



this drill holes can be drilled at any desired angle and in the most inaccessible of places.

The K-M portable Earth Drill, operated by air-motor driven from portable air-compressors, are quick to assemble. The cutting member consists of a hardened steel cutting head below a Link-Belt screw conveyor, which brings the cuttings to the ground surface. Cutting members are available for drilling holes from 5 in. to 12 in. diameter. There is a special cutting head, with adjustable blade, which permits of successful drilling in mud, sand or clay without grabbing.

In addition to its use in driving the Earth Boring Drill, the Ingersoll-Rand Air Motor is adaptable for operating pipe tapping machines, and for all types of drilling, such as steel plates, timbers, etc. The air-compressor shown in the accompanying picture is a general utility unit of many and varied uses.

For a descriptive folder and additional information, write Ka-Mo Tools, Inc., 5525 West Ohio St., Chicago, Ill.

Tire Branding Outfit

• The above pictured electric tire branding outfit is being offered by Master Mfg. Co. of Chicago.

The ½ inch letters in the electric torch are interchangeable and as many as seven letters can be used if desired.

For leaflet describing this and other models of branding outfits write Master Mfg. Co., 1400 W. Fulton St., Chicago.

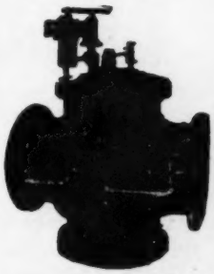
·1879·

ROSS

AUTOMATIC VALVES

ALTITUDE VALVES
for
Control of elevation and heads into and out of tanks, basins and reservoirs.
1. Single acting.
2. Double acting.
3. Combination assembly for three or more automatic operations.

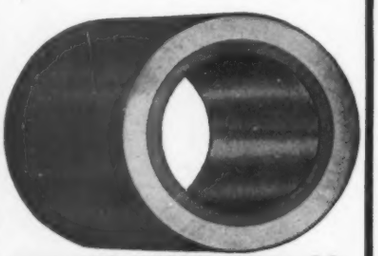
COMBINATION VALVE
Combination automatic control both directions through the valve.
A self-contained unit, with three or more automatic controls.



REMOTE CONTROL VALVE
Electric remote control—solenoid or motor can be furnished.
Adapted for use as primary or secondary control on any of the hydraulically controlled or operated valves.

ROSS VALVE MFG. CO.
INCORPORATED
P. O. BOX 595, TROY, N. Y.

THE LINING IS IMPERVIOUS
THE JOINTS ARE LAPPED
LIPCo PIPE
AVAILABLE *Now!*
Immediate DELIVERY
ON
STEEL, TONCAN IRON
AND WROUGHT IRON
Cement Lined Service Pipe



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HYDRO-TITE

A DEPENDABLE self-caulking joint compound used to joint cast iron bell and spigot pipe. Much easier to use than lead and makes stronger, more flexible and tighter joints.

Employed on thousands of miles of pipe from 4" to 60". Write for our free trial offer.

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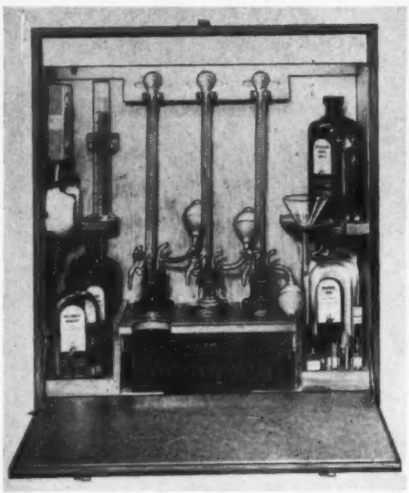
OVER 25 YEARS WITHOUT A FAILURE

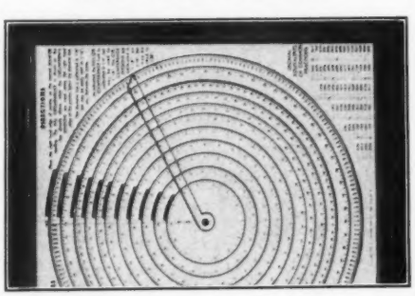
Water Testing Equipment



● A new series of Water Test Sets is announced by W. H. and L. D. Betz, of Philadelphia, Pa. These "A" Series Test Sets include the necessary chemicals and apparatus for determining hardness, alkalinities, chlorides, phosphates and sulfites in water, when any two, three or four of these tests are required. A special cabinet designed for use on table or wall is provided. All chemicals and apparatus are contained in the cabinet, held in a secure position and ready for instant use. A portion of the opened cabinet door forms a convenient acid-resistant laboratory work table, and a fluorescent light provides correct illumination for the tests. The protection afforded by the cabinet minimizes breakage and eliminates errors caused by dust or dirt.

Descriptive literature may be had by writing W. H. and L. D. Betz, Gillingham and Worth Sts., Frankford, Philadelphia, Pa.

The Wolfe Divizor

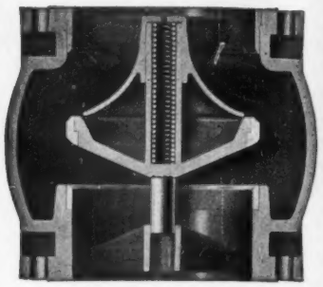


● The Wolfe Divizor is an instrument for securing instant readings of diameters and circumferences of circles. It measures 12 x 12 inches flat or 4½ x 12 inches when folded.

The Divizor gives circumference divisions in as many parts as desired at a glance—and on this score should prove useful to designers. As indicated it can be folded for convenience. With a single setting all readings are to be found along the right edge of the pointer.

If interested request descriptive folder from Interstate Sales Co., 1123 Broadway, New York City.

SMOLENSKY
VALVES



■ The Smolensky Radialflow Noiseless Check Valve eliminates friction head loss, which assures operating efficiency and noiseless operation.

Designed to be constructed with a cast iron body, plug, spider, and made with a renewal bronze valve seat or seat of other metal when required.

Specify Smolensky Valves for your water works plant and assure yourself years of trouble-free service.

●

Economy—Durability

THE SMOLENSKY VALVE CO.
1931 W. 47th STREET, CLEVELAND, OHIO

INSTALLATIONS WORLD WIDE
LARGEST CITY TO SMALLEST VILLAGE

VALVES COMPLETE EQUIPMENT FOR WATER WORKS FILTRATION AND SEWAGE DISPOSAL PLANTS
LATEST "COREY TYPE" HYDRANTS

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IOWA VALVE CO.
General Offices:
Hubbell Bldg., Des Moines, Iowa
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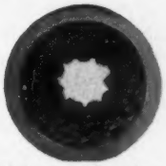
★ THE NATIONAL METHOD • OVER 35 YEARS EXPERIENCE ★

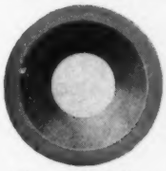
GUARANTEED TO RESTORE 95% ORIGINAL CAPACITY

DEFENSE DEMANDS

FULL CAPACITY MAINS



Before Cleaning



After Cleaning

MANY cities that now find their water supply resources sadly overtaxed by the additional thousands of water users in defense industries and nearby army training camps, are turning to the *NATIONAL METHOD of water main cleaning* as an economical means of improving water service.

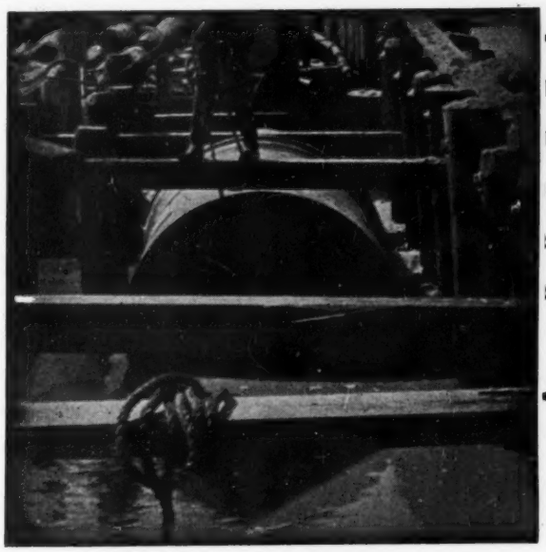
Cleaning by THE NATIONAL METHOD restores clogged mains to at least 95% of their original carrying capacity, making unnecessary large expenditures for auxiliary pipe lines, increased power at the pumps, new standpipes, etc.

The NATIONAL METHOD

The National Water Main Cleaning Co.

30 Church St. Branches: New York

115 Peterboro St., Boston, Mass.
910 William-Oliver Bldg., Atlanta, Ga.
7103 Dale Ave., St. Louis, Mo.
3812 Castellar St., Omaha, Neb.
406 Fla. Theatre Bldg., Jacksonville, Fla.
205 W. Wacker Dr., Chicago, Ill.
501 Howard St., San Francisco, Calif.
2028 Union Ave., Montreal, Can.



84" pipe—Spring Lake, N. J.

FLANGED PIPE

FLEXIBLE JOINT PIPE

BELL & SPIGOT PIPE

SPECIAL CASTINGS

SHORT BODY BELL & SPIGOT SPECIALS

Large stock enables us to make prompt shipments.

CAST IRON PIPE

SIZES 2" TO 84"

Warren Foundry & Pipe Corp.

11 Broadway, New York

Warren Pipe Company of Mass., Inc.

75 Federal St., Boston

Micro pH Testing

La Motte Chemical Products Co. have just perfected a new and improved Micro pH Testing Set for making pH determinations which is said to offer facilities never before available in the colorimetric system of pH de-

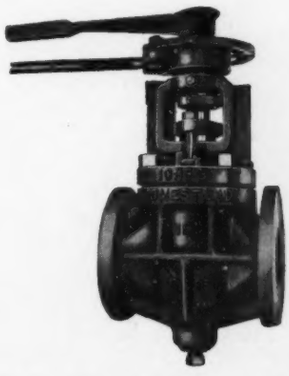
terminations. The basic feature is that the new unit requires less than 0.5 ml. of sample. The sample may be highly colored or turbid, the pressure of such interfering factors being compensated for in the improved procedure, which requires one minute or less to complete.

The Standard Unit (Model B) covers the pH range 5.2 to 8.4. To extend this range, additional buffer mixtures, indicator solutions and Diffusion Glass Plates can be had. The complete (boxed) test set is a mere hand-full.

For a leaflet more adequately describing this new Micro pH Testing Set, and the simple directions for its use, write La Motte Chemical Products Co., Towson, Baltimore, Md.

Homestead Lever-Seald Valves

● The Lever-Seald plug type valve is a product of Homestead Valve Mfg. Co. The principal features of this valve are its positive (sealed) seating, quarter turn for full open to sealed shut position, dimensions of this plug type valve are such that its face to face dimensions are identical with those of corresponding sizes in wedge gate valves.



The principal leverage produced by the lower lever and screw does two things. First, it assures positive seating of the valve in either open or closed positions. Second, its controlled adjustable lift raises the plug just a few thousandths of an inch—i.e., just

FLOATLESS
Electronic
LEVEL CONTROL

For all sewage and water work—pump programming or deep well operations.

- ***No Float Switches***—Photoswitch Level Controls operate entirely by electronic relays . . . employ no float switches.
- ***Unlimited Life*** — Photoswitch Level Controls are built for timeless service . . . have no mechanical parts to wear out—no wartime replacement problems.
- ***Low Cost***—Photoswitch Level Controls are simple and inexpensive to install . . . and over a period of time show the lowest average unit cost.

Write for Level Control Bulletin 1100

PHOTOSWITCH INCORPORATED
PHOTO-ELECTRIC & ELECTRONIC CONTROLS FOR EVERY INDUSTRIAL PURPOSE
CAMBRIDGE, MASSACHUSETTS

METER MITTENS

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Meter Mittens insulate water meters against heat loss and save many basement meters from freezing. Inexpensive, costing but a fraction of the expense of a frozen meter. Write for catalog now.

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In keeping with the urgent need for conserving metal wherever possible, the J. A. Zurn Mfg. Co., of Erie, Pa. has developed a Vitreous Glazed Earthenware interceptor, replacing the former cast iron unit.

The Zurn V. G. E. Greaseptor is stated to be better than 90% efficient at the rated capacity of 25 G. P. M. It utilizes the same basic "floatation" principle of grease interception that has always been identified as a distinguishing feature of Zurn Greaseptors. Approximately 90 per cent of the interior of the interceptor is available for the function of grease interception—a ratio that is unusually high for this type of device.

The only metal used on the Zurn V.G.E. (Vitreous Glazed Earthenware) Greaseptor is for cover clamps and pipe connections. This is but 2 per cent of the metal ordinarily used in these units. The Zurn V.G.E. Greaseptor body is, when handled with reasonable care, as durable as cast iron and has the added advantage of smoother surfaces. It affords perfect resistance to thermal shock, so vital in a fixture receiving alternate surges of hot and cold water.

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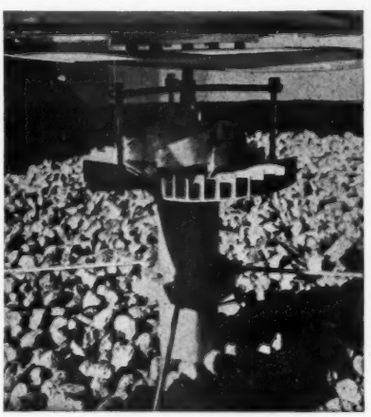

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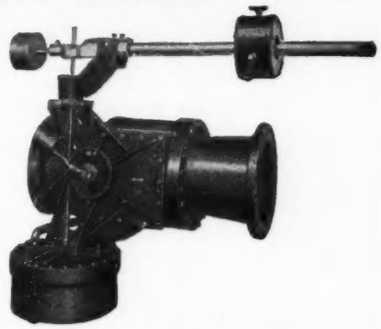

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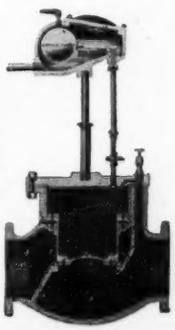

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Along with the pennant for the plant flagpole, each employee of the company winning the pennant is presented with a sterling "E" lapel insignia, highly prized and proudly worn.

H. L. Watson Becomes De Laval's President

H. L. Watson, since 1934 Executive Vice-President and Director of the De Laval Steam Turbine Co., Trenton, N. J., has been elected to the Presidency of that company, succeeding Francis J. Arend, who died, August 24, 1942.

From 1913 to 1934, Mr. Watson was General Sales Manager. He graduated from Rose Plytechnic Institute, Terre Haute, Ind., in 1905 and served as erecting engineer and later as sales engineer, specializing in steam turbine work, with the Allis-Chalmers Co. until he entered the employ of the De Laval Co.

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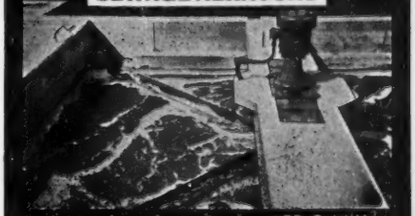

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William E. Clow Passes

● William E. Clow, who pioneered in the plumbing and heating business, ended a successful career as chairman of the Board of James B. Clow and Sons, died in Chicago on September 14th. He was born Sept. 23, 1860, in Industry, Pa., and early in life began a remarkable career.

With his father, Captain James B. Clow, William E. Clow at the age of 18 years formed a partnership and started the new firm under the name of James B. Clow & Son. Later, his brothers—Charles R., Harry B., and James C.—entered the company, and the name of the firm was changed to James B. Clow & Sons.

From this humble beginning the firm, always under the guiding hand of Mr. Clow, showed a steady growth, until today it is recognized as one of the largest jobbers of plumbing and heating supplies in the United States, as well as one of the largest manufacturers of cast iron pipe, with factories in Chicago, Birmingham, and Coshocton and Newcomerstown, Ohio.

In 1928 James B. Clow & Sons purchased the National Cast Iron Pipe Co., of Birmingham, Alabama, at a cost of $3,500,000 and today the plant, known as National Cast Iron Pipe, is a divisoin of James B. Clow & Sons.

To have weathered the storms through a business career of more than sixty years might not, of itself, be such a great accomplishment—but for a youth of 18 years to embark in business on borrowed capital of $300, repay that loan within a week and build that business into one of the greatest in its field, with assets in the millions, was indeed a great accomplishment.

Although Mr. Clow passed away just a few days before he would have been 82 years old he was still active in the affairs of the company which he started 64 years ago.

Penn Salt Has New Director

● At a recent meeting of the Directors of Pennsylvania Salt Mfg. Co., Francis Boyer was elected a director.

Mr. Boyer is Exec. Vice President of the Smith, Kline and French Laboratories of Philadelphia.

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Bailey Meter Opens Additional West Coast Offices

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● Bailey Meter Co. announces the appointment of L. F. Richardson as branch manager of its newly established Los Angeles office and H. T. Sawyer as branch manager of its newly established Seattle office. Messrs. Richardson and Sawyer had previously been located in Los Angeles and Seattle but had functioned as representatives of the San Francisco office.

V. A. Rumble, manager of the company's San Francisco office, continues as West Coast Supevisor.

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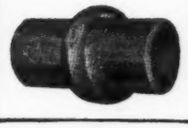
Penn. Salt Reports Largest Sales in Company's History

Pennsylvania Salt Mfg. Co., in its annual report to stockholders, reports for the year ending June 30, 1942, the volume of net sales in the history of the company—namely, $19,552,300, representing a 19.7 per cent increase over the year preceding. However, taxes cut into profits so deeply as to leave net earnings actually 13.8 per cent lower than in the year preceding. It is interestingly disclosed that the company has paid out as taxes during the year the sum of $2,596,516 which may be compared with $149,393 paid as taxes in 1933.

The report discloses that 28 fundamental chemicals and many chemical specialties are provided by Penn Salt, which are supplied to 19 different industries.

WESTON



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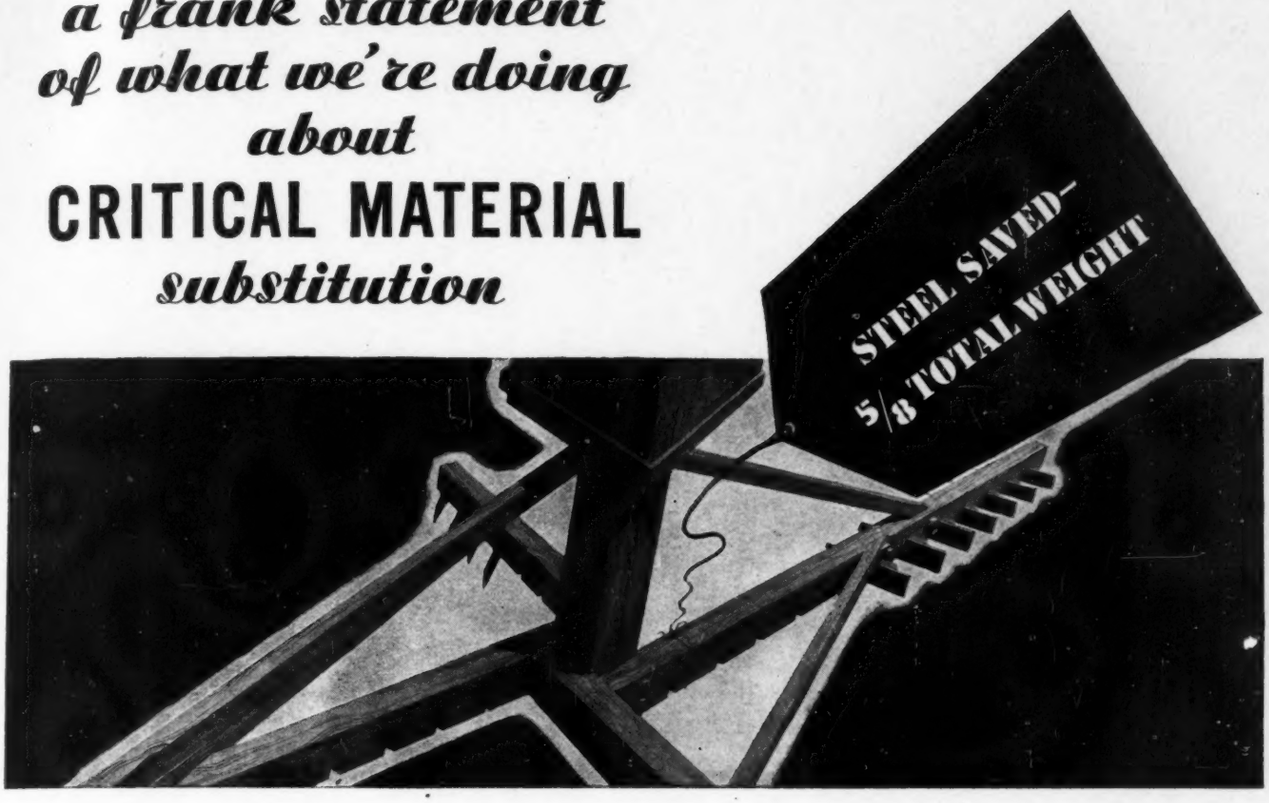
a frank statement of what we're doing about

CRITICAL MATERIAL *substitution*



Through critical material substitution, a recent design study showed a saving of 5000 lbs. of critical steel out of an 8000 lb. total weight on one machine alone! Important—yes—but more important still is the fact that it was not an isolated case. For we are making every effort to use the minimum of critical materials in all our equipment.

★ ★ ★ ★ ★

For instance, we are redesigning, using wood structural members for walkways, handrails, cross braces and paddles wherever possible.

We are running tests on special wood products to be used where this ordinary timber won't stand the gaff due to lack of tensile strength or resistance to wear and water. Many of these tests are proving to be successful, which will enable us to carry the use of wood as a substitute still further.

The all-essential aluminum and brass in skimmers have been eliminated. The use of mercury in Distributor mechanisms has been cut to a minimum and where possible, dispensed with entirely.

Finally, we are now indicating on all our drawings where the client himself can use less critical material without endangering operation. In some cases this means concrete instead of steel in piers—in others, wood instead of reinforced concrete in tanks.

★ ★ ★ ★ ★

We can't build a plastic Clarifier—or Distributor—or Digestor. Critical material substitution is, for us, a slow and painful process. It won't enable us to supply you for less money—and in most cases you'll have to wait a bit longer for delivery due to design changes. But it will enable us to make more equipment available—with less critical material consumption. And in most cases these substitutes can be replaced with the original materials when "criticals" are again available.

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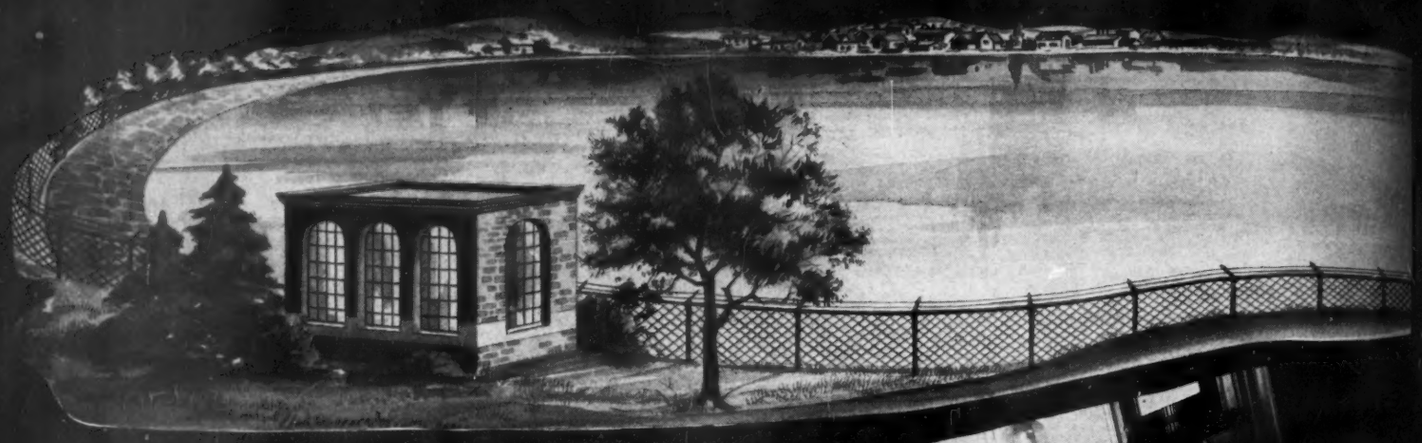


The future won't be an easy one for water plant operators. Further population shifts may mean increased demands and pollution of the supply sources. Industrial pollution of streams and rivers may also increase.

Yet you will be expected to maintain safe water in spite of natural or man-made emergencies, and to do it with limited manpower and restricted delivery of equipment and supplies.

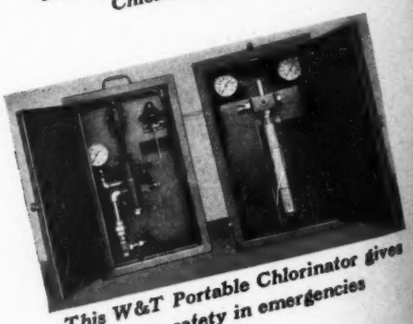
One good way to get set for whatever may come is to make a complete CHLORINATION check-up right now. You'll want to make sure that your plant Chlorinators are in perfect working order, giving close control over the wide range of application rates that coming conditions may require. Possibly you'll want to rearrange connections so as to get more service out of stand-by units, or to give more flexibility to points of chlorine application.

Then, future emergencies must be considered, and provision made for treating temporary sources, for sterilizing repaired mains, and for secondary chlorination whenever the distribution system may require it.

Your local Wallace & Tiernan Representative is anxious *to help you make the best possible use of your present equipment,* supplementing it with new facilities only where public health requires it. If you call him now, he'll have a chance to go over your equipment and discuss your problems before a critical situation arises, and can arrange his trip so as to save on transportation.

SA-140

Plan now for a check-up of your Chlorination equipment



This W&T Portable Chlorinator gives extra safety in emergencies

W&T Men know the problems that arise with scenes like these